The use of photogrammetry and film in fostering understanding of early medieval history

Roger Lang

Abstract

The recent arrival of a growing body of freely available photogrammetric 3D models of early medieval stone sculptures gives the opportunity for educators to use them as virtual primary sources, either directly as navigable objects or through the medium of film. The research investigates their potential role in schools following the current national curriculum in England. The curriculum requirements are reviewed and their implementation investigated through a study of school websites and Ofsted reports in an English shire county. A search is made for suitable stone sculptures with 3D models, new ones are made where necessary, and the academic literature on the sculptures is reviewed. Lesson plans and resources are created and trialed in three primary schools in a method closely resembling cyclic Lesson Study methodology. The conclusion is that the process has demonstrated the potential for the use of 3D models to serve as the focus of engaging and challenging lessons.

Contents

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1.1 Introduction

This thesis stems from a 2016 RSA[1] Fellowship project undertaken by the author. That project addressed a dearth of engaging and challenging learning materials to support the teaching in primary schools of the Viking aspect of the early medieval period. It also sought to widen the narrow impression given by the 2014 English National Curriculum (hereafter ENC) of the Viking diaspora in the British Isles. It worked with two primary schools, one in rural Cumbria, the other in inner-city London, to create learning resources about the tenth-century Gosforth Cross. The resulting materials include two lesson plans and two films (Lang, 2016a; Lang, 2016b) that make use of a photogrammetric 3D model of the piece created for the project by Professor Dominic Powlesland (2018)[2]. The project was successful within its objectives in that, as well as resulting in the first post-Victorian[3] 3D record of the cross, it made some contribution to widening the range of learning materials about the early medieval period. The materials are freely available on a website currently funded by ArtUk (Culture Street, 2016). However, the resources only incorporated the 3D image as a means of producing an optimally-lit animation of the cross, not as a classroom resource for direct study by children. In this regard, the project identified the need to further explore the pedagogic use of 3D models.

The research explores the educational and technological viability of a broader use of 3D models of early medieval stone sculpture in the education of upper primary school children, both as objects for analysis, and as ingredients of short film. It focusses on some intriguing artefacts in the North West of England which have barely been used in the way William Slater Calverley hoped, as 'the means of teaching many generations chapters of the history of their country, which could never have been written had not such

[1] Royal Society for the encouragement of Arts, Manufactures and Commerce

[2] A full list of Acknowledgements for the Gosforth Cross project is given in appendix 4

[3] In 1882 a plaster cast was made for what is now the Victoria and Albert Museum.

old-time picture books been rescued from the destroying hands of the careless and indifferent' (Calverley,1899, p.184).

1.2 Methodology

Even at a time when archaeology is increasingly involved in cross-disciplinary work, not least in the Viking period, (Griffiths & Harding, 2015), this thesis, though centred in that subject area, ranges across a particularly wide hinterland of other curriculum territories such as art history, education theory, the politics of curriculum design, geology, and information technology. The core research enquiry is, "Can photogrammetry and film be used to create online learning materials that enrich the early medieval content of the History component in the English National Curriculum 2014 (DfE, 2013a)?" This broad question leads to a series of more specific queries which can be categorised into three areas (Figure 1). The objectives of the first phase of the thesis consist of answering these questions. Literature reviews are integrated into the text on a section-by-section basis.

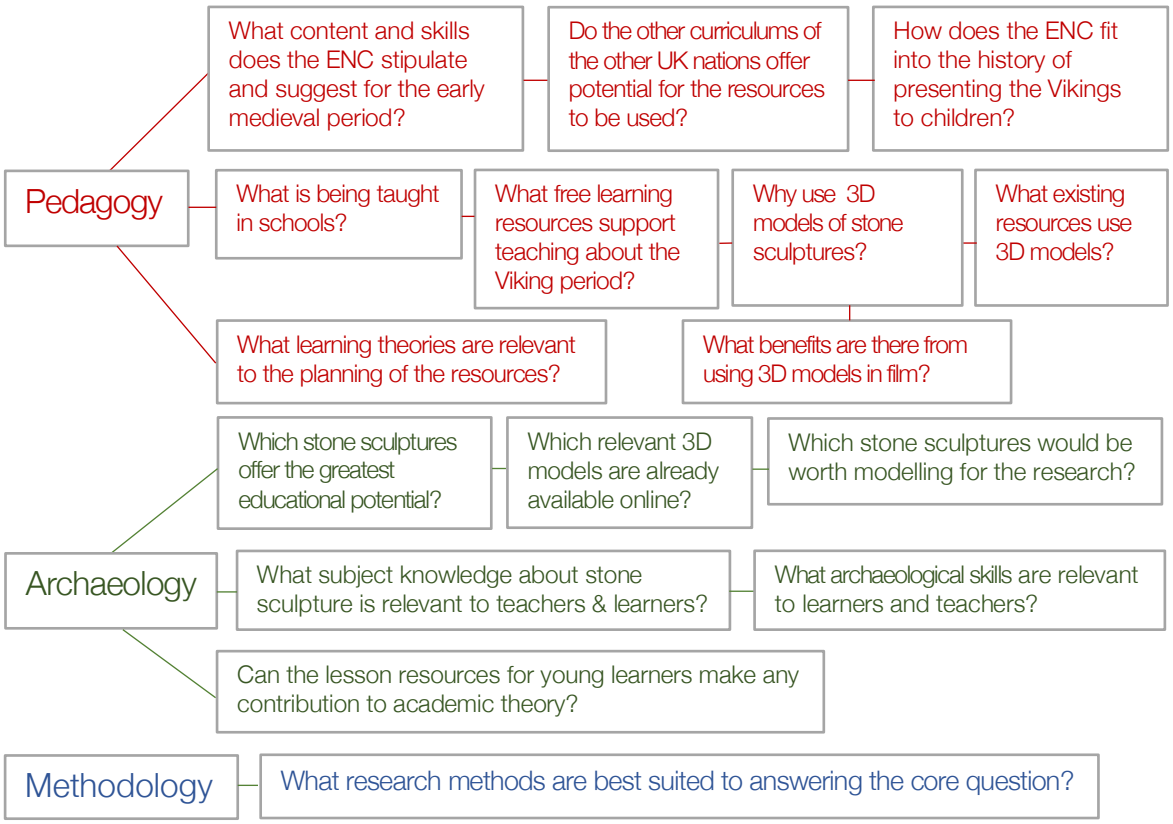


Figure 1 : Phase one — Desktop research and literature reviews

The research focusses on the Viking diaspora in England, arguably the aspect of the period least-well served by the suggestions of the ENC. The implementation of the present curriculum requirements is analysed using a survey of the websites of all 215 Local Authority-controlled primary and junior schools

in Cumbria and of their most recent Ofsted[4] reports. The pedagogy review explores the relevance of two theories which, though dating back to the last quarter of the previous century, are having an increasing positive impact on successful learning. The review of existing online learning materials is limited to free resources, because the particularly serious financial constraints on school budgets means that these are the ones most likely to be used, and also because few of the commercial producers enable academic researchers to obtain review copies and are understandably reluctant to share sales statistics. A brief survey is also made of the relevant 3D models of early medieval stone sculpture and other artefacts already freely available online. An account of academic theories is written for each of the stone sculptures used in the resources, based on literature reviews and some original archive research. Having far greater time to research and reflect on the objects than would be available for classroom teachers meant that it became possible to uncover aspects that could be used as learning opportunities, even if at first sight they seem too abstruse for primary education. As described in the section on pedagogy, subject knowledge is currently considered of critical importance to successful teaching, and as primary teachers need knowledge of a wide range of subjects, providing condensed summaries of current academic thinking can be of real benefit.

The results of *phase one* are used to inform the creation of lesson plans and additional materials. Nine primary schools, in urban, suburban and rural areas, were invited to participate in trials of these resources. They were selected primarily because of their proximity to important stone sculptures from the Viking period, thus giving them an opportunity to meet the ENC requirement for an element of 'local study', an added incentive for participation. Three schools replied; two from Cumbrian market towns and one from an outlying suburb of a small city.

During the initial meeting with staff, the class teachers expressed their willingness for the researcher to teach the lessons while the they observed the pupils' learning. They were asked to observe the children's learning during the trial of new versions of the lessons originally developed for the RSA project, the first about representations of the Sigurd and Fafnir narrative on the Halton Cross and a Swedish rune stone,

[4] The Office for Standards in Education, Children's Services and Skills

the second taking the Gosforth Cross as its subject. In addition, they were asked to select one of three other lessons; about hogbacks; about the provenance, polychrome and skeuomorphic properties of *Penrith 11*; or about the nexus of links between *Kirkby Stephen 01*, *Gosforth 05* and *Great Clifton*. Two schools chose the hogbacks lesson and the other school selected *Penrith 11*. Consequently full lesson plans were written about hogbacks and *Penrith 11*, and elements about *Kirkby Stephen 01*, *Gosforth 05* and *Great Clifton* were added to the final trial of the Gosforth Cross lesson. The preliminary meeting with teachers prior to the trial lessons in their school gave the chance for the plan and the resources to be improved by including their suggestions, for example by incorporating any particular approaches relevant to their school's policies. This had already happened in the first school involved in the RSA project, which was at the time carrying out a whole-school implementation of an exploratory talk and '*interthinking*' policy, as espoused by Littleton and Mercer (2013). Interthinking involves children using talk to collectively think through a problem in a way that is respectful of others' opinions.

In some ways, the methodological approach of phase two (Figure 2) resembles Action Research (Altrichter, Posch, & Somekh; 2007Cohen, Manion & Morrison, 2018.). It is however, much closer in spirit and practice to the Lesson Study model. Lesson Study is a research practice that spread to the West in the last decade of the twentieth century. At that time it was becoming recognised as a major factor in the success of the Japanese education system where, as *jugyou kenkyuu*; 授業研究, it had been in use since the late nineteenth century (Dudley, 2015; Lewis, 1998). In essence it involves a group of two or more teachers identifying an area of the curriculum that they judge could be more effectively delivered; planning a lesson informed by a literature review or other expert input; teaching the lesson and observing its effects on the learning of a group of pupils, for example by questioning pupils during the lesson; reflecting on what was observed; and refining the lesson plan as deemed appropriate. This is seen as an ongoing cycle of continual improvement rather than as a means of achieving the unachievable Perfect Lesson. In this it strongly resembles Popper's schema of scientific method $P_1 — TS_1 — EE — P_2$, where the scientist identifies an initial problem (P_1), devises a hypothesis or trial solution (TS), attempts to identify flaws in the that solution (EE - *error elimination*) resulting in a working hypothesis that will lead to further problems (P2) and further cycles of the 'quadruple' (Popper, 1972).

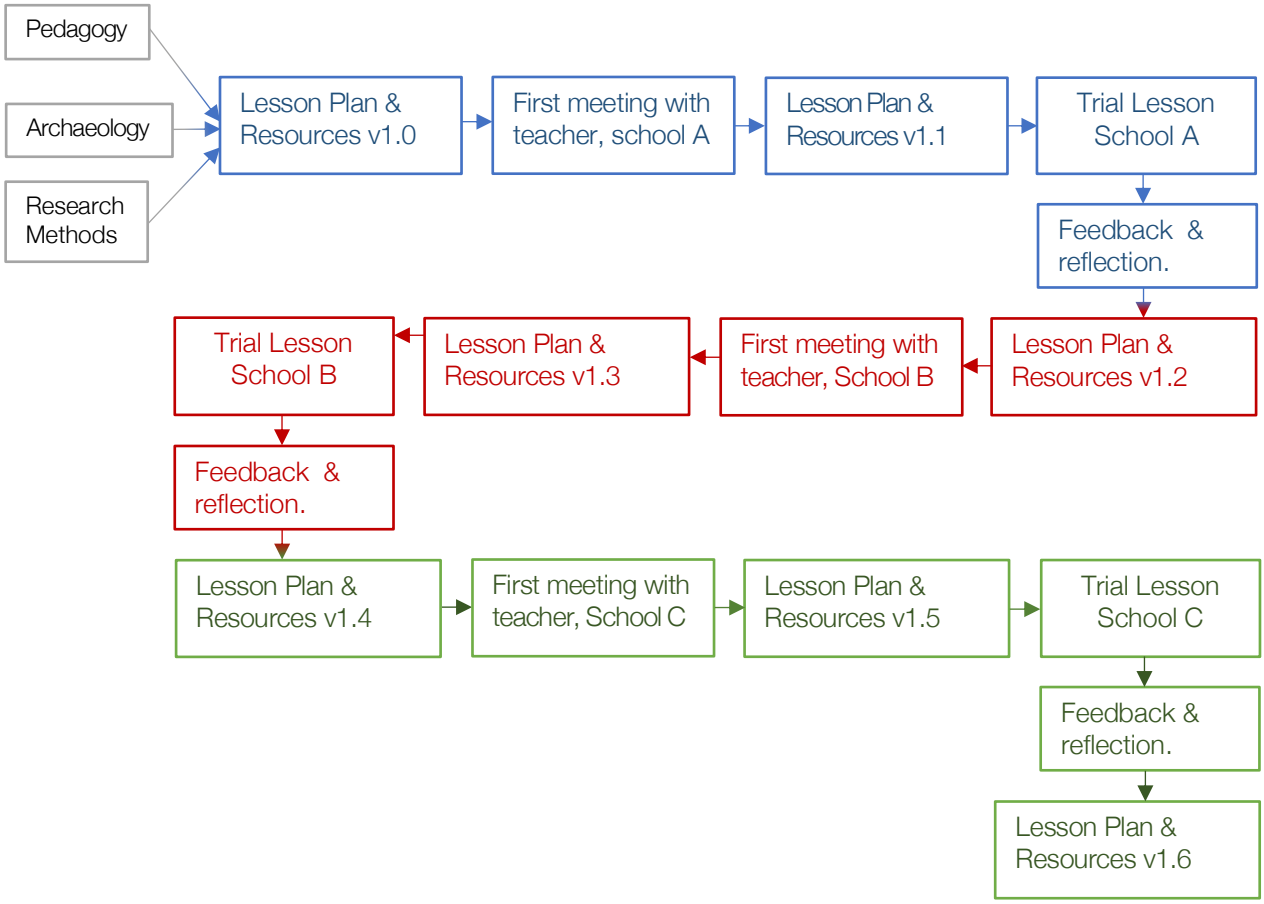


Figure 2: Phase two — School-based research

Whereas in Japan, Lesson Study operates on a local, district, and national level, in the United Kingdom it has usually been implemented on a small scale, a major project in London having proved the most important exception to date (Dudley, Xu, Vermont & Lang, 2019). Phase two of this research differs from mainstream Lesson Study practice in that only one teacher, the researcher, chose the subject for the research and made the original plans and resources. The researcher also supplied the element of 'literature review or other expert input' alluded to above in the description of the Lesson Study process.

1.4 Corpus of Anglo-Saxon Stone Sculpture

Names and numbers, in italics, are used to identify early-medieval stone sculpture and lettering of their sides refer to the classification used in the Corpus of Anglo-Saxon Stone Sculpture (hereafter CASSS). CASSS is an invaluable aid to any research on early medieval stone sculpture in England. Two exceptions

are made to the use ; the Halton and Gosforth Crosses are referred two by name alone, and their sides by the compass direction they face.

2.1 The 'Vikings' in Present Day UK Curriculums.

It is important before starting to produce learning resources for English schools to be aware of the relevant requirements of the ENC. Any consideration of their use in other areas of the United Kingdom requires an understanding of the marked difference in the curriculums across the other three nations. When considering History resources it is also instructive to examine the background to the political attitudes reflected in the wording of that curriculum.

The current iteration of the ENC was published in 2013 and came into force in the following year. Its implementation is mandated by statute in all English schools that fall into the category of being community schools; i.e., schools that are funded and controlled by a local authority, and in faith schools which usually receive additional support from religious bodies. Academies and Free Schools are exempt from having to meet the ENC's requirements.

The ENC prescribes the subject content and skills that pupils are expected acquire during each Key Stage (hereafter 'KS') of state education prior to the upper secondary years; KS1, age 5 to 7; KS2, ages 7 to 11; and KS3, ages 11 to 14. The KS4 curriculum is determined by the syllabuses of the examination boards, overseen through The Office of Qualifications and Examinations Regulation (Ofqual). In the ENC, each subject area has its own section. These sections vary greatly in length between the 'core subjects' (English, maths and science), and the nine 'foundation subjects', which include history. The history curriculum section for the whole of KS1 and KS2 totals less than 1,300 words (DfE, 2013a). 'Archaeology' is not one of the words.

Subject content is required to be covered predominantly in chronological order. It is set out in the form of nine bullet-point statutory requirements, for example; 'the Roman Empire and its impact on Britain'. Each of these requirements are illustrated by three, four or five non-statutory examples of aspects that can be covered, such as, 'British resistance, for example, Boudica'. Effectively, the chronological coverage of

British history starts with the 'New Stone Age' period which, usually be taught during year 3. Sadly this disregards important Mesolithic sites, most notably Star Carr for which Henson (n.d.) has produced an impressively detailed bank of learning resources. The early medieval period is required to be taught in KS2. In primary schools large enough to have one or more class per year group, the period is usually studied in Upper KS2 (ages 9 to11 - years 5 and 6), with the Viking element more often than not addressed in year 5. In smaller schools where years 5 and 6 are taught in the same class, the curriculum is typically delivered in a two-year cycle. In very small schools, where the entire KS2 cohort forms a single class, the KS2 history curriculum will commonly be delivered achronologically over a four-year cycle.

Two of the statutory requirements focus on the early medieval period; 'Britain's settlement by Anglo-Saxons and Scots' and 'the Viking and Anglo-Saxon struggle for the Kingdom of England to the time of Edward the Confessor'. It is worth making a synoptic comparison of the exemplar subject topics suggested by the curriculum document (Table 1).

Anglo Saxons	*Vikings*
• *Anglo-Saxon invasions, settlements and kingdoms: place names and village life* • *Anglo-Saxon art and culture* • *resistance by Alfred the Great and Athelstan, first king of England* • *Anglo-Saxon laws and justice*	• *Viking raids and invasion* • *Further Viking raids and Danegeld*

Table 1: Synoptic view of subject content suggestions extracted from the English National Curriculum (DfE, 2013a, p. 4).

From the six bullet point suggestions a reader unencumbered by a knowledge of the subject would glean that of the two peoples; Anglo-Saxons alone possessed a culture, theirs was the one legal system worth knowing about, it was they who coined English place names; and they who produced the two Early Medieval individuals meriting a mention. In contrast, the Vikings are clearly the stage villains of the piece, little more than a plot-device to provide opponents for the Great Alfred to resist. Their activities are confined to the allied trades of invading and raiding, albeit with an unpleasant side-line in protection

racketeering in the form of Danegeld. Danegeld is particularly significant in this context since it has for over a century provided a potent example for anyone seeking justification for 'resistance' to foreigners. The Historical Association's 'Scheme of Work for Primary History' (Historical Association, 2013), appears to have been written for an earlier draft version of the ENC as the wording of the statutory requirements

Published Version in English National Curriculum for History	*Earlier version in Historical Association Scheme of Work [emphasis added]*
1 Britain's settlement by Anglo-Saxons and Scots	1 Britain's settlement by Anglo-Saxons and Scots including the establishment of the Saxon Kingdom.
2 the Viking and Anglo-Saxon struggle for the Kingdom of England to the time of Edward the Confessor	2 the Viking and Anglo-Saxon struggle for the Kingdom of England to the time of Edward the Confessor including Saxon-Viking rivalry **and co-operation** up to 1066

Table 2: Two versions of the statutory requirements relevant to Vikings, reproduced from the English National Curriculum (DfE, 2013a, p. 4) and a scheme of work by the Historical Association [emphasis added] (2013, p. 1)

is different (table 2) and nowhere in its 17 pages is there any mention of Danegeld. The effect of the changes is to accentuate the binary view of the two groups.

The most encouraging recent development in the English education system with regard to the teaching of the early medieval period has been brought about through the Schools History Project (hereafter 'SHP'). Since 2016, there has been an option to teach a module on 'Viking Expansion' as an element worth 20% of the 'OCR[5] SHP GCSE B' an OCR GCSE syllabus created in collaboration with the SHP (OCR, 2019). The first examinations on the course took place in 2018, and the examiners' report was generally favourable about the way the students had been prepared (OCR, 2018). No statistics have yet been made available on the number of candidates entered for the *Viking Expansion* option, but over 16,000 pupils sat the paper in which it is included. The syllabus reflects a well-rounded view of the Viking period, including, for example, the eastward expansion along the Volga and to Baghdad. The endorsed textbook for the

[5] (Oxford, Cambridge and RSA examination board)

course (Culpin, 2017) is impressive, frequently cites archaeological evidence, and presents tasks that require higher order thinking skills. It contains one reference to stone sculpture from Yorkshire; *Middleton 02*, one from the Isle of Man, and two from Sweden.

The History curriculums of the other United Kingdom nations vary considerably. Scotland has no particular specific requirements for content subject matter in history, which is categorised as a 'social subject' (Education Scotland, 2017, p. 7). The Welsh National Curriculum subject content for pre-conquest history contains no reference to Vikings (Welsh Curriculum History, 2008). In Northern Ireland, the Council for the Curriculum, Examinations and Assessment also makes no specific requirement to teach about them, has recently produced an innovative set of 'Minecraft' sandbox video game materials about Vikings supporting STEM[6] enquiries to 'connect science and technology to a topic traditionally viewed as a history-only topic' (CCEA, 2018). However, on the limited inspection available to anyone with no access to the North Ireland schools' intranet, the Minecraft Viking resources do not appear to cover the particular areas covered in the lesson resources resulting from this research.

2.2 Vikings and Danegeld in the context of historic books for school-age children.

Though any political motivation for the late inclusion of Danegeld as a suggested item in the 2014 curriculum must be purely conjectural, the subject of these payments has been an important metaphor in United Kingdom foreign relations for over a century and a brief consideration of its earlier pedagogic uses can offer a perspective on its reappearance.

At a time of expanding German influence, Kipling skilfully deployed the theme of the payment of protection money in "Dane-geld: A.D 980-1016". The poem was first published, without a title, in "A School History of England" (Fletcher and Kipling, 1911). The subject of Danegeld only appeared once in the pages of Hansard prior to the publication of Fletcher and Kipling's textbook, and only then in the context of a complaint about the difficulty of naval cadets' examination papers (LC Deb, 1874). Since 1911, it has appeared 163 times as an illustrative cautionary tale in parliamentary debates, most famously in the

[6] Science, Technology, Engineering and Maths

speech made by Winston Churchill, in the first sitting following the Munich Agreement on October 5, 1938 (HC Deb, 1938). However, its use as a didactic device in histories written for a young audience predates Kipling's poem, and is to be found in a lesser-known work by an even better-known author.

Charles Dickens' "Child's History of England" was published in serial form from January 1851 to December 1852 (Dickens, 1852, pp. 25–31). Dickens' 'Danes' are amongst the most-dastardly villains in the whole of the author's output: 'pestilential', 'false', 'cowardly', 'daring and cruel' they 'plundered and burned' and decapitated the unfortunate King Edmund after tying him up and firing arrows at him. Only after being vanquished by the 'best and wisest king that ever lived in England', and converting to Christianity do they arrive at that state of grace wherein; "They plundered and burned no more, but worked like honest men. They ploughed, and sowed, and reaped, and led good honest English lives" (Dickens, 1852: p. 31). Appendix 1 examines a depiction of the Danes encounter with Alfred in an 1852 painting by Dickens' friend, Daniel Maclisse.

On a positive note, despite its quaintly Dickensian approach to this aspect of early medieval history, the ENC does require teachers to include 'depth studies' that, 'help pupils understand… the complexity of specific aspects of the content'. This gives the scope to investigate something of the wider view of Viking diaspora presence in England that can be gathered, alongside other sources, from the archaeological evidence of stone sculpture, and to present data to foster a more nuanced view than that found in the subject suggestions of the ENC.

3.1 The Survey of Cumbrian Schools

In order to gain insight into the way the ENC requirements for the Viking element of the early medieval period, as described above, are being delivered, it was decided to analyse the websites of a cohort of English primary schools and to read their Ofsted reports.

English schools are required by statute to provide information on their websites detailing the curriculum they deliver (Great Britain, 2018). The survey looked at any reference in such accounts, explicit or implicit, to the study of the Vikings. The research sought for any mention of the skills the ENC requires be fostered by the subject, and any evidence of the school providing a wider, more balanced view of the Viking

diaspora, for example, by organising visits to Jorvik, or to the 'Vikings Revealed' gallery at Tullie House Museum, Carlisle. The survey also recorded the number of pupils on roll at each school in three categories; >100, 50—99, and <50. The significance of the class size is explained in the Results section below. The other set of documents investigated were Ofsted reports made during the past four years, since the implementation of the current ENC.

The group of schools chosen for this aspect of the research were those Junior and Primary schools in Cumbria for which the Local Authority retain direct responsibility; 215 in total. Infant schools were not investigated, because as mentioned above, the early medieval period is not required to be taught to pupils in their age range. The 30 primary-age academies in the county, and the two Cumbrian Free Schools were also omitted from the study, as such schools are not required to follow the National Curriculum. The main reason for choosing Cumbria was that the county is particularly blessed with stone sculptures from the early medieval period, an important minority of which strongly reflect the presence of a Viking diaspora. The Gosforth Cross displays arguably the best-preserved and most detailed treatment of the Ragnarök narrative from the period, but there is also a strong supporting cast of other Cumbrian stone sculpture that makes England's far north-west an obvious choice. The county is divided into six administrative regions all of which contain important pieces recorded in volume two of the Corpus of Anglo-Saxon Stone Sculpture (Bailey & Cramp, 1988). Two other important monuments, the Halton Cross and the Heysham Hogback lie less than 12 and 17 kilometres south of the Cumbria Lancashire border respectively. As written records of the Viking diaspora are negligible and as Cumbria is so rich in primary evidence carved in stone, there seems to be a strong case for using these resources in the county's schools to support studies of local history aimed at helping learners to enrich their understanding of the period beyond the 'Vicious Vikings' stereotype.

The Cumbrian cohort is also a reasonably representative set of English schools being 52nd of the 162 Local Authorities as measured by the Ofsted category ratings of their schools (Watchstead, 2019). The obvious unrepresentative aspect of the county's schools when considered in the national context is the very low number of children for whom English is not the home language. In this respect its function as a representative set is limited to the category of the 'shire counties'.

3.2 Results of the Survey: The Schools' Websites

Of the 215 schools reviewed, 52% mentioned the Vikings in their curriculum subject content description. At first sight, this seems a strikingly low figure, particularly as amongst the information the Ofsted lead inspector has been expected to analyse in preparation for an inspection visit is "the statutory sharing with parents of curriculum information" (Ofsted, 2018, p. 17). However, the wording of the guidance to schools, to publish online, "the content of your school curriculum **in each academic year** [emphasis added] for every subject" (DfE, 2018) could easily be taken to mean that the information is required just for the current academic year. This is a relevant issue for smaller schools where more than one year-group, sometimes as many as four, are taught in the same class. In such settings, the curriculum follows a multiple-year cycle, usually two years for primary schools with roughly 50 to 100 pupils, four years for the very small schools. Thus a school can be in compliance with the letter of the statutory guidance without disclosing implementation of the full curriculum that children experience during their time in KS2. In consequence, for the 18% of Cumbrian schools fewer than 50 pupils, there could be a three-in-four chance that they would not be teaching the Viking element of the curriculum in the present academic year. The incidence of very small schools failing to cite Viking coverage in their curriculum is higher than that for the global cohort figure, 69% as against 48%, but for the schools in the <100, >50 subgroup it is only 46%. Another factor that renders the statistic difficult to interpret with precision is the small minority of schools that have offer no detail of any of the foundation subjects on their website.

With regard to the skills requirements for the History (DfE, 2013a) though they are a fundamental aspect of the curriculum, the wording of the online guide introduces potential ambiguity: "the **content** [emphasis added] of your school curriculum" can be interpreted as an abbreviation for the *subject knowledge* content, thereby granting scope to an incomplete description. Despite this, 22% of the schools made reference to the skills they aimed to foster in History and all of these corresponded closely to the ENC requirements.

Evidence for a wider view of the Vikings than that presented by the ENC's non-statutory suggestions was found in 13% of the 215 schools; 26% of the schools that mentioned the Vikings in their curriculum. It was represented by details such as arranging a visit to the Jorvik centre, visits by historically informed re-

enactors and exploratory learning in which pupils evaluate the extent to which the image of 'Vicious Vikings' is an over-simplified stereotype. Crucially, in the context of this research, there was no reference in any of the schools' websites to early medieval stone sculpture.

3.3 Ofsted Reports

Ofsted reports are written in a generic form, but the lead inspector is given the scope to cite examples of practice in any area of the curriculum to illustrate their evaluations of teaching and learning. Only two of the 215 inspections mentioned teaching and learning about the Vikings. Both examples were commendatory. One cited use of a cross curricular theme on the Vikings, praising the way it engaged pupils' interests and provided them with the opportunity to apply skills across the curriculum. The other reference, not quite so encouraging, mentioned the use of a re-enactor described as a 'Viking with horns on his head', suggesting that neither the school, the 'Viking', nor the Ofsted Lead Inspector were aware of current thinking on Norse headgear. Believing that Vikings were fashion-victims drawn to bovine headgear, is of course a trivial mistake, but can be a clue to a wider lack of knowledge.

Of the 192 Ofsted HMI Inspectors listed in 2015 (Ofsted, 2015), ten had qualifications in History. This figure is in line with the percentage of primary headteachers with history degrees (Great Britain. Department for Education; Welsh Government; Scottish Government; Northern Ireland Department of Education. 2018). There were no Inspectors with qualifications in Archaeology and the percentage of primary heads with degrees in the subject is not published. An updated list of Her Majesty's Inspectors (Ofsted, 2018) included Inspectors in all the English regions, except the North West.

The result of the survey of Ofsted reports, less than one percent mentioning pupils learning about the Viking era, is not particularly surprising. There were comparatively few mentions of any history practice, and those there were tended to refer to events recent to, or coinciding with, the inspection visit. The focus of Ofsted framework during the period these reports were written was predominantly directed on standards in the core subjects, rather than the curriculum of foundation subjects such as history (Spielman, 2018). A new framework for Ofsted inspections with a sharper focus on the curriculum, its breadth and delivery, is currently 'out for consultation' (Spielman, 2018).

3.4 Conclusion from the surveys

Though the statistics from this survey have to be read through an opaque filter of qualifications as detailed above, there are a few visible indications relevant to this project.

- Of the schools that include the Vikings in their account of the curriculum, a quarter seem to be presenting a wider view than that suggested by the ENC.
- despite the inexplicit wording of statutory requirements, 22% of the schools mentioned the skills requirements of ENC History.
- no schools displayed any reference to the use of early medieval stone sculpture in their curriculum.

A positive conclusion from this, in the context of the present dissertation, would be that there is an existing interest in schools to present a wider view of the Viking diaspora, a potential need for resources to foster the development of skills and a totally unexploited potential for the use of internationally significant artefacts such as the Gosforth Cross.

4.1 Relevant free online materials currently available.

Another important consideration was to examine existing learning materials to check that there was nothing freely available to schools that used early medieval stone sculpture as a primary source in teaching about the Viking diaspora in England.

The internet has been a prime source of learning materials for teachers for well over a decade. Recker, Dorward and Miller (2004) published an early study of the phenomenon in American schools, focussing on the search methods employed by teachers, and finding that the practice was wide-spread and accepting that many of the online resources were high-quality materials.

The pressure on state school budgets in the United Kingdom is generally perceived to have increased in recent years and physical textbooks are already being phased out by one of the leading publishers (Pearson, 2019) as online textbooks are more likely to be purchased by schools. Teachers are also

increasingly likely to search for free materials as the results below confirm and as commercial resource producers were reporting in private communications at this year's BETT[7] Show.

An internet search for teaching materials about Vikings is likely to return several entries on the first page for items from the TES (Times Educational Supplement) online bank of lesson resources (TES, 2019). The repository currently, as at 20th July 2019, contains 1,058,591 downloadable learning materials many of which are free to use. The website announced in 2014 that it had passed the one-million per day mark (TES, 2014). The figure is obviously due to the website's availability throughout the world (other than where blocked by government firewall), but its main usership seems, understandably, to be in the English-speaking world and purchases in local currency are only possible in the USA, Australia, Eire, Canada and New Zealand. The TES bank is therefore an obvious place to make a short indicative study of the materials that teachers rate as valuable.

A search of the TES resources for 'Vikings' in late July 2019, filtering them to materials for the 7-11 age group and ordering them by 'highest rated', resulted in a return of 1,200 items. Some of the items were mis-identified as being Viking-related, presumably having been mis-tagged by the uploader. The first 100 correctly tagged returns were examined for their pedagogic approach, for their historical accuracy and balance, and to see if they were free or 'premium' resources. The latter of these criteria produced the most striking finding. Of the one hundred highest-rated resources about Vikings, only one was not available to download for free. The lowest-rated 100 were almost opposite, only one being free.

The implicit or explicit pedagogic approach of the resources was analysed on the basis of the revised version of Bloom's Taxonomy (Anderson & Krathwohl, 2001) into three bands. Lower order learning, covers tasks involving mainly factual recall, or displaying a basic understanding of concepts and is present in exercises such as 'cloze-procedure' comprehension, where the learner is given a fixed choice of answers to a question. Middle order learning, consists of tasks requiring learners to be able to apply what they have learned, for example by reworking information in a different medium or applying knowledge in a different context. Higher order learning, is used to describe learning in which analysis, synthesis or

[7] Formally 'British Educational Training and Technology'.

creative thinking are employed. Of themselves, these categories are not necessarily meaningful in the classroom situation, as a skilled teacher will be able to use many lower order learning resources in ways that require deeper levels of thinking from the children, but they may reveal the pedagogical awareness of the resource's creator and there is the obvious risk that such materials will be used without alteration making for an unchallenging and lacklustre learning experiences. Encouragingly, the highest-rated resource had a range of higher order learning tasks, and many of the resources that the site's viewers rated in the lowest 100 were colouring-in exercises devoid of even lower-order learning content.

The historical accuracy and gender bias of the resources was examined. There were few significant historical inaccuracies. Resources that covered runes tended to give diagrams of what were described as 'The Viking Runic Alphabet' that were of the pre-Viking Migration Period *elder futhark.* This is understandable if the related activity is for learners just to transliterate their own name in runes: the minimalist *younger futhark* lacks many of the letters the children would need, and would require the teacher do some tedious explanatory talk and the users to cope with a system where runes corresponded with multiple letters in the alphabet they are used to.

The main problems with the materials found on the TES resource bank are of omission. Only one of the resources dealing with Viking trading and expansion refers to their eastward progress along the Volga and their presence in Byzantium and Baghdad. Resources describing Viking religion only provide names and modern images of a few gods and one goddess, with some brief reference to their roles and attributes. The subject of Viking religious action can easily be addressed by providing a hyperlink to the Danish Museum's reconstruction of the royal residence at Tisso (Naturpark Åmosen, 2013) which from 2 minutes, 19 seconds in, gives a good archaeology-based treatment of religious sacrifice as well as a fine reconstruction of a 'cult house' and the 50 metre-long hall at an important Danish site. Religious action and the Viking presence on the Volga could also be combined with a sensitively edited account of the horrific rite of passage witnessed by Ibn Fadlan, for which Price gives a well-written synopsis (2012).

Despite most of the information reproduced having its original source in archaeological discoveries, the resources have little or no reference to archaeology. But the greatest, and sadly least surprising, omission

in most of the resources is the subject of Viking women. Much work has been done over the past three decades by Jesch (1991) and others (Norrman, 2008; Moen, 2012) revealing the important contribution to Viking culture made by females, but little relating to women tends to filter into public awareness, apart from the recent 'female warrior burial' presence in the tabloid press and its virtual incarnations (Daily Mail, 2017).

A request was made to TES Resources for download statistics for; the top 10 highest-rated of the resources, excluding those with no, or minimal, Viking-related content, two resources lower down the ranking, and for the lowest-rated resource. TES Resources kindly supplied the figures for the past 12 months, broken down into all countries and UK only and for total downloads and total views. The numbers of downloads for an item can sometimes exceed those of its views, because teachers may make a repeat download through a direct link rather than via the page describing the resource.

Resources Inventory Title	rating (1 to 1,616)	Measures Total All Countries Downloads	Measures UK Total Downloads	Measures Total Premium Downloads	Measures Total Free Downloads	Measures Total Views
Vikings ahoy!	1	0	0	0	0	1,616
Viking Boy by Tony Bradman Chapter 1 Comprehension Skill Specific Questions Y5/6	2	629	502	0	629	1,336
Viking Adventure Story	3	906	794	0	906	1,204
Viking Boats	5	3,838	3,266	0	3,838	2,769
Viking Music	8	225	187	0	225	376
Viking Homes	9	889	738	0	889	805
Invaders - Romans, Anglo-Saxon and Viking Planning	10	289	253	0	289	211
The Vikings, Runes	18	4,116	3,461	0	4,116	3,686
VIKINGS	19	691	573	0	691	1,114
Viking Boat Booklet	21	1,276	969	0	1,276	2,218
Scheme of Work: Anglo Saxon, Viking and Scots settlement in Britain	61	488	432	0	488	1,015
Viking long ships activity sheets	79	1,286	1,117	0	1,286	1,457
Vikings settle down	80	338	296	0	338	473
The Vikings: A Raid in England (789AD)	1,210	1	0	1	0	16
		14,972	12,588	1	14,971	18,296

Table 3: TES Resources; view and download statistics, August 2018 to August 2019.

The figures (Table 3) have one anomaly – the highest rated having 1,616 views but no downloads. The chief findings are as follows.

84% of the downloads were made by users in the UK; it was not possible to produce figures for the individual UK nations. The most downloaded resource was about 'Viking runes' with resources about Viking longships also being popular.

A search over the whole of the TES Resource Bank revealed no reference to the Gosforth Cross, any other of the stone-sculptures that used in the resources produced in the present search, or the use of online 3D images of objects from the early medieval period.

Other online resources likely to be used by teachers were examined, but with very few exceptions they were disappointing. The BBC does provide a fine set of learning resources that can be used as lesson ingredients. There are 20 short videos on the Vikings, pitched at KS2, which include simple cartoons, short purpose-made films and more extended clips from Neil Oliver's 'In 'Search of Vikings'. (BBC Videos, n.d.) There are also some sound 'Classroom Ideas' for teachers accompanying each clip, the best of which involve a significant degree of higher order learning. There are also 6 'Learners Guides' (BBC Guides, n.d.) with some simple examples of interactivity. Useful though they are, none of the BBC resources contain any in-depth look at Viking diaspora stone-sculpture, nor any mention of insular settlement by Vikings who had already become Christians.

The Council for British Archaeology's 'Young Archaeologists Club' website has a number of well-presented Viking-related craft activities that could be incorporated into a cross-curricular theme. The site's bread-making activity based on evidence from excavation of graves in Birka, Sweden is a good example of archaeological discovery being incorporated in an engaging learning experience (Young Archaeologists Club, 2019).

'Pinning Down the Past: Archaeology, Heritage and Education Today' (Corbishley, 2011) written in the first decade of this millennium, compiles an impressive and varied bank of good examples similar to the Birka-bread activity, many of which could, given permission, be reworked as online activities or

downloadable learning resources for teachers. Again though, nowhere is there mention of stone sculpture from the early medieval, or any other period, having been used in education.

The most impressive UK source of information on early stone sculpture produced for teachers is the well-researched and beautifully-presented set of materials from Historic Scotland. First published in 2009 it is now available for free download from Historic Environment Scotland (Historic Scotland, 2016) . A 39-page overview booklet 'Investigating Early Carved Stones' covers three periods 'Early Peoples', 'Pictish Stones' and Early Christian stones' providing all the background knowledge a teacher would need with some sound suggestions for lesson activities. More detailed booklets are also available for specific sites.

4.2 Existing Resources: Conclusion

Other than the example form Historic Environment Scotland cited above and the materials from the Gosforth Cross RSA Fellowship project, there are currently no significant educational resources about early medieval stone sculpture that support the teaching of history to the almost one-and-a half million UK children in KS2.[8] There are some good online free resources about the Viking period available for teachers, some of which support a more balanced view of the role the diaspora played in insular history, but few that give much of an understanding of the lives of female members of the community. Crucially, in the context of this research, no resources were found that involved children in investigating online 3D models of early medieval stone sculpture.

5.1 3D models as learning resources.

Early medieval stone sculptures provide important evidence about the assimilation of the Viking diaspora in northern England. The RSA project demonstrated that narrative illustration on some of these pieces have potential to engage learners and can be easy to 'read' in a way that the few surviving written sources are not. Most of the more interesting pieces are only easily physically accessible to a few schools, the Gosforth Cross being the most spectacular example of the unhappy coincidence of archaeological

[8] Latest published figures for all UK schools are for academic year ending 2017 when 720,200 pupils were aged 10 and 702,100 aged eleven. 84% of the total of school-aged children were in English schools Great Britain. Department for Education; Welsh Government; Scottish Government; Northern Ireland Department of Education (2019).

Figure 3: Augmented Reality: model of Gosforth Cross (Powlesland, 2018) beside the reconstructed Halton Cross. Screengrab photo on Google Pixel phone: R.Lang.

importance and geographical isolation. The recent availability of online 3D models provides schools with ways of at least virtually visiting the artefacts. At present, for most schools this can only be done on a 2D screen by accessing 3D models that can be rotated and zoomed in and out. Schools that possess recent more powerful iPads or Android equivalents have the facility to enable objects to be observed in augmented reality (hereafter AR), i.e. to appear on the screen as objects incorporated in the view of the room seen through the camera on the device. AR is also accessible on certain smart phones and requires 4G or higher connectivity. AR models can be viewed outdoors, enabling the comparison of a virtual artefact with one in the real world (Figure 3). The virtual object remains fixed in the place it first appears and can be walked around.

A small minority of schools, no published data was found, have bought virtual reality (VR) headsets. These give wearers the ability to experience the object in stereoscopic 3D. They exist in two main forms, cheaper models such as *Google Cardboard* that are made to house mobile phones, or higher specification products like *Oculus Rift* that have purpose-made screens and lenses. Both AR and VR are supported by the Sketchfab website. None of the schools visited during this research had hand-held devices capable of supporting AR, nor any VR headsets. A commercial resource 'Sigurd and the Dragon', made for London Grid for Learning (hereafter LGfL) by Inspyro and nominated for the leading industry award in 2018, has used the Halton cross model made by Lang, (2017c) in a VR and AR resource (LGfL, 2017). LGfL materials are made available to London schools through their broadband connection and services package. It is designed to be used with 'Google Cardboard' headsets and other more robust products using the same software. At the time of writing Inspyro are working on a way to determine the number of London schools using the resource.

Almost all of the early medieval artefacts on the Sketchfab website were produced using photogrammetry, one of five main ways in which 3D virtual or printed copies of real-world objects can be made. It has the advantage of producing a convincing surface appearance whilst being low-cost in terms of equipment requirements; a standard digital single lens reflex or micro four thirds camera and a tripod being all that is necessary for high quality results. The process involves a series of overlapping shots are taken close to the object, with each point on the surface being present in at least three photographs. The scan of the Halton Cross stump was made from 182 full-frame 35mm images. The iris of the lens is set at *f*-stop of 8 or narrower to ensure as much as possible of the photograph is in focus, and the light sensitivity of the sensor is set to a low value in order to avoid extraneous visual 'noise'. Consequently, even outdoors, the shutter will need to be open for longer than a thirtieth of a second, hence the need for the tripod. Ironically, this twenty-first century equivalent of the Victorian plaster-cast has to often employ a nineteenth-century photographer's long exposure times. Several commercial and one open source software products are currently available to process the images, identifying common points between the pictures and plotting the surface structure essentially with the same core triangulation calculations used to map the contours of topography.

The other methods that can be used in an archaeological context involve the use of expensive hardware. Those that employ lasers produce more accurate results in a fraction of the time, but only hybrid equipment that blends lasers with photography creates results as visually satisfying as photogrammetry. And even though a patina of moss and lichen is far removed from the brightly painted and possibly bejewelled surface of the sculptures as they were intended to be seen, it resembles a reality more real than the grey plastic finish of a laser-only scan.

5.2 Film using 3D models

Incorporating 3D models into short films provides an exceptionally cost-effective way of making realistic, visually engaging learning materials. Conventional footage of artefacts can be faded seamlessly into 3D models, which can be revolved and zoomed to follow a narration and optimally lit to highlight any details being described (Lang, 2016a; 2016b; 2017d). Silent films of 3D models can be made as an alternative if due to technological or firewall issues it is impossible for learners to use Sketchfab models. Opaque

drawings, can be layered over such films to highlight details (Lang, 2019e). All the film editing and compositing for the resources used in this project was made using the free version of *DaVinci Resolve* colour-correction and non-linear video editing software, and the free and open source *Blender* 3D computer graphics software toolset. Recent versions of *DaVinci Resolve* also provide an excellent tool for adding closed-captions, commonly called subtitles, an important consideration for d/Deaf users and a way for multiple users in a classroom setting to view films on laptops if no headphones are available. All the films with soundtracks made for this research have closed captions.

5.3 3D Early Medieval Stone Sculpture Online.

The main online source for models of early medieval stone sculpture is the Sketchfab website. Though a commercial site, uploading and viewing 3d models is free and many major museums have their own self-curated sections on its pages. As at August 2019 it claims to host over 3 million models, the large majority of which are original artworks created using with commercial software or Blender. A significant minority of the models have been made using photogrammetry: there are no published statistics of how many, but Sketchfab encourages the practice by facilitating direct uploading of models made using 'Agisoft' software, the most commonly used to create the models that appear in the following tables.

A search of the site for 'Hogbacks' revealed 19 models of 13 Hogbacks. All but Decartes' untextured laser scan of Govan 3 were made using photogrammetry. The distribution of the pieces is a mixture of the unsurprising; five being from Glasgow, the only large city with a significant hogback collection, and the remarkable; two iterations of the hogback at Papa Westray — a site isolated even for most Orcadians.

CASSS or Lang, #	Hogback Title on Sketchfab	Model Creator	url	year	views
Brompton 19	Brompton Hogback (draft)	Roger Lang	https://skfb.ly/6LyUJ	2019	17
Castledermot, Eire	Castledermot Hogback Burial Stone	Castledermot History	https://skfb.ly/6MyDq	2017	343
Gosforth 04	Gosforth, Hogback the 'warriors tomb'	Prof. Dominic Powlesland	https://skfb.ly/6MyCP	2016	89
Gosforth 04	Gosforth, Hogback Warriors Tomb textured	Prof. Dominic Powlesland	https://skfb.ly/6KHGU	2016	141
Gosforth 05	Gosforth, Hogback Saint's Tomb textured	Prof. Dominic Powlesland	https://skfb.ly/6JnJW	2016	138
Gosforth 05	Gosforth, Hogback, Saint's Tomb untexturec	Prof. Dominic Powlesland	https://skfb.ly/6MyCJ	2016	105
Govan 1	Govan002	Megan Kasten	https://skfb.ly/6HODt	2017	759
Govan 1	Hogback Stone 1 - Govan Stones	Liam McKinstry	https://skfb.ly/6MyBX	2018	105
Govan 3	Govan Hogback Stone	Li Sou	https://skfb.ly/6KxGo	2018	107
Govan 3	Govan 12 Hogback	Aligator Descartes	https://skfb.ly/6KWVE	2017	101
Govan 5	Hogback [Govan: Untextured]	Wojtek Wolkowski	https://skfb.ly/6MyC6	2017	23
Heysham 05	Hogback, St Peter's Church, Heysham	Roger Lang	https://skfb.ly/6HV9V	2017	398
Inchcolm	Hogback Stone, Inchcolm Abbey	Historic Environment Scot	https://skfb.ly/6KzO9	2019	46
Penrith 06(a)	South-east Hogback, Giant's Grave, Penrith	Kenneth Lymer	https://skfb.ly/6MyBB	2017	172
Penrith 06(a)	Hogback Tombstone - St Andrew's, Penrith	Monument Men	https://skfb.ly/6KHHn	2017	82
Papa Westray	Hogback Gravestone, St Boniface's, Orkney	Dr H Anderson-Whymark	https://skfb.ly/6MyCw	2017	267
Papa Westray	Papa Westray Hogback Stone	Stefan Sagrott	https://skfb.ly/6MyCS	2017	41
West Kirby 04	The West Kirby 'Hogback'	Roger Lang	https://skfb.ly/6KwWE	2019	39
Wycliffe 05	Hogback, St Mary's Church, Wycliffe	squeaking cat	https://skfb.ly/6KWJs	2018	39

Table 3: Hogbacks on the Sketchfab Website, as at 6 August 2019. Identification numbers of English Hogbacks from Bailey, R.N. & Cramp, R. (1988), Bailey, R.N. (2010) and Lang, J. T. (1991), those of Scottish pieces from Lang, J.T. (1973).

A similar search for 'High Crosses' netted a curiously random array of virtual objects from manga-style characters to imaginary weapons, but did include the 34 complete or partial scans of High Crosses listed in Table 4. There must also be some missed by the search engine since only one of Powlesland's versions of his Gosforth Cross model was included. Irish High Crosses are best represented with 15 examples.

Cross Name	Location	url	uploader	added	views
Drumcliffe HC	Co. Sligo	https://skfb.ly/6Mzzq	H. Fenton	2017	579
Muiredach's Cross, Monasterboice	Co. Louth	https://skfb.ly/6MzzF	The Discovery Programme	2015	558
Cross of Sts Patrick & Columba, Kells	Co. Meath	https://skfb.ly/6HRWv	The Discovery Programme	2015	1,200
Camus Cross - Monikie,	Angus	https://skfb.ly/6MzAv	Dundee Howff Conservation	2016	137
Clones HC	Co. Monaghan	https://skfb.ly/6JRV8	The Discovery Programme	2016	987
Pictish Stone, Logierait Churchyard,	Perthshire	https://skfb.ly/6MzAM	Dundee Howff Conservation	2016	300
Trewidden medieval wayside cross	Cornwall	https://skfb.ly/6MzBp	Tom Goskar	2015	270
Kildalton Cross, Islay	Inner Hebrides	https://skfb.ly/6MzBx	Archaeovision	2017	218
Kildalton Cross, Islay	Inner Hebrides	https://skfb.ly/6MzBD	Dr Alice Watterson	2017	45
Southern High Cross, Clonmacnoise	Co. Offaly	https://skfb.ly/6MzBK	The Discovery Programme	2015	315
Kells, North Cross	Co. Meath	https://skfb.ly/6MzBT	The Discovery Programme	2016	114
Ahenny High Cross Reduced	Co. Tipperary	https://skfb.ly/6MzBZ	CWES Consulting	2018	14
High Cross - Govan Parish Church	Glasgow	https://skfb.ly/6MzC8	Liam McKinstry	2019	13
Kilfanora High Cross	Co. Clare	https://skfb.ly/6MzCB	danderson4	2016	19
Reefert High Cross, Glendalough	Co. Wicklow	https://skfb.ly/6MzCJ	The Discovery Programme	2014	72
Castledermot High Cross	Co. Kildare	https://skfb.ly/6MzCN	CWES Consulting	2015	91

Reefert High Cross, Glendalough	Co Wicklow	https://skfb.ly/6MzCV	The Discovery Programme	2014	72
Bealin High Cross	Co. Westmeath	https://skfb.ly/6IQXZ	Westmeath Heritage Plan	2018	351
Termonfeckin Cross	Co. Louth	https://skfb.ly/6MzDr	Archaeological Consultancy	2017	80
Hackness Cross	Yorkshire	https://skfb.ly/6MzDH	Dominic Powlesland	2014	255
Emlagh High Crosses,	Co. Rosscommon	https://skfb.ly/6MzDR	H. Fenton	2016	68
Woodwray Pictish Stone	Angus	https://skfb.ly/6MzDU	Hugo Anderson-Whymark	2018	52
Downpatrick High Cross,	Co. Down	https://skfb.ly/6MzPA	1manscan	2016	56
Isle Martin early medieval cross slab,	Ross & Crommarty	https://skfb.ly/6LZBs	jamesmcc	2018	146
Sigurd Cross Slab (Manx Cross 120)	Isle of Mann	https://skfb.ly/6JPVI	manxnationalheritage	2018	62
Clagh Ard Cross Slab (Manx Cross 100)	Isle of Mann	https://skfb.ly/6MzR6	manxnationalheritage	2018	61
Forteviot Ring Cross,	Perth And Kinross	https://skfb.ly/6MzRv	Open Virtual Worlds	2016	87
Kilwinning Stone,	Ayrshire	https://skfb.ly/6MzRC	Liam McKinstry	2019	15
Peterborough Cathedral Cross Shaft	Cambridgeshire	https://skfb.ly/6MzRJ	Dominic Powlesland	2019	27
Aberlemno 2, Angus	Angus	https://skfb.ly/6MzRP	Eleanor Harrison	2017	19
Gosforth Cross,	Cumbria	https://skfb.ly/6MzRZ	Dominic Powlesland	2016	123
Hackness Cross, High Res 61K,	Yorkshire	https://skfb.ly/6MzSt	Dominic Powlesland	2014	85
2M Hackness Cross closed holes 1 tex.	Yorkshire	https://skfb.ly/6MzS7	Powlesland	2014	122
Cross Slab, Aberlemno,	Angus	https://skfb.ly/6MzSA	Darren Eyers FSA Scot	2018	52

Table 4: 'High Crosses' on the Sketchfab Website, as at 6 August 2019.

Other searches, for example for 'Viking Age stone' uncover further pieces on Sketchfab such as the excellent assemblage of runestones made by a Copenhagen scanning studio (Rigsters, 2018).

Publishing through Sketchfab is currently the most effective method for making 3D models freely available as its use by the British Museum and the Corpus of Anglo Saxon Stone Sculpture attests. However, it has received some academic criticism. Ulguim (2018) writing in the highly sensitive context of the 3D modelling of human remains, criticises Sketchfab for the lack of information accompanying many of the models she found. She also expresses a concern that some of the uploaders choose to openly allow downloads of their models thus raising the possibility of information contamination through altered versions appearing on the internet. She quotes Guisen, McCarrison and Park (2013) as stating that such 'poorly documented' collections pose a threat as they have 'little value for research or educational use'. None of these criticisms apply to early medieval sculpture. The absence of information about an object

can usually be remedied with an internet search, for example from the online volumes of CASSS. The quoted criticism of such resource banks having little educational value, written incidentally before the launch of Sketchfab, is hopefully answered in this thesis. With regard to manipulating downloads of models, the criticism reveals a lack of awareness of the technology: anyone with the skill set to rework a 3D object file would not need to download the model ready-made, but could recreate it using screenshots taken from sufficient angles. The only way to prevent copies of models is not to publish them at all. A more valid concern is that though Sketchfab is currently operates a successful well-respected website used by prestigious museums and galleries, it is a commercial company with no absolute guarantee of its long- term survival.

5.4 Early Medieval Stone Sculpture Online: Conclusions

Though other more sophisticated technologies are available, at the present time, photogrammetry is the best option for the limited budgets of Heritage Sector and others seeking to provide free education resources.

There already exist a bank of online models that have significant potential as education resources. There remain many other archaeologically important, and pedagogically valuable early medieval stone sculptures still to be recorded and published in 3D.

6.1 Pedagogy of the resources produced by the research

As outlined in the section on the National Curriculum for History, the 80% of state schools that are neither academies nor free schools are required by statute to implement the 2013 curriculum. Under the Autumn 2019 Ofsted framework, all categories of schools will be inspected under an agenda that takes an increased interest in the breadth and quality of the curriculum. The delivery of a worthwhile implementation of the curriculum's requirements for the teaching of British history must be of benefit to the public reputation of individual schools, as well as meeting the more important duty to provide "a high-quality history education will help pupils gain a coherent knowledge and understanding of Britain's past" (DfE, 2013a, p. 1).

The strategies used in the devising the learning materials made as part of this research aim to deliver both knowledge and understanding by setting tasks that require the higher-order learning skills of analysis, evaluation and creation as defined above. At the same time they will support the acquisition and application of knowledge. Any pedagogy that concentrates either solely on the acquisition of knowledge, or sees understanding as paramount, and dismisses knowledge as something that can be accessed at need in a web-based culture, fails to meet a basic principle that has been identified since the Axial age. Much of the philosophy of education can be viewed as footnotes to verse fifteen of the second book of Confucius' Analects : 'Learning without thought is labour lost, thought without learning is perilous' (Legge, 1893, p. 150).

The resources and lesson-plans also take into account Cognitive Load Theory (Sweller, 1998) — hereafter CLT — which argues that learning is only possible if there is an existing framework of understanding, a *schema*, onto which the newly acquired data is attached. Without this framework the learners' transient short-term memories have no way to transfer the information into areas of the brain capable of long-term storage. Stephen Pinker uses a particularly apt metaphor, 'Disconnected facts are like unlinked pages on the web: they might as well not exist' (Pinker, 2005). One important consequence of applying this understanding in practice, is that learning should be broken down into small chunks that are linked wherever possible to existing learning.

The core lessons, on the Halton and Gosforth Crosses make use of storytelling. At first sight, this appears to falsify a fundamental part of the CLT hypothesis: that the short-term memory wipes out information for which there is no existing 'schema' scaffolding within 20 to 30 seconds, and yet, primary age children, having listened to a five-minute story for the first time, can recall the main events with ease. Kalugya and Singh (2016, p. 850) ascribe humans' ability in the skill of listening in their basic native language, to a genetic predisposition caused by evolutionary pressures to rapidly and intuitively attain certain schemas. In terms of how this operates with stories, it may be reasonable to conjecture that the sequential form of a narrative, in which characters and events are linked in a chronological causal chain, builds its own 'schema' scaffolding as it proceeds. This need not happen passively, since prediction is also an important part of listening to a story, building the schema in advance as narrative progresses. In terms of the Norse

myth, once we know that Baldr's mother has omitted to get verbal agreement from mistletoe not to harm her son, we are already anticipating a plant-related outcome that will not go well for the young god.

6.2 Andragogy: Supporting Teachers' Subject Knowledge

A report for the Sutton Trust (Coe, Alosi, Higgins, & Elliot Major, 2014, p. 2) addressing the question "What Makes Teaching Great?" identified the depth of teachers' knowledge of the subjects they teach, along with the quality of instruction, as the two factors for which there is the strongest evidence of positive impact on student outcomes. Primary school teachers have to acquire knowledge in eleven National Curriculum subjects plus Religious Education. The last Office for Standards in Education publication on this matter (Ofsted, 2008) acknowledged that across the primary curriculum very great demands were made on teachers' subject knowledge. It reported that even where teachers possessed good pedagogic skills, a lack of subject knowledge could result in tendencies; to give priority to objectives related to literacy rather than to those of the subject being taught; to fail to provide appropriately challenging tasks; and to inadequately respond to pupils' errors and misconceptions or to their more probing questions. They acknowledged that teachers had no wish to deliver poorly-prepared lessons, and recommended a number of measures to support them in developing their subject knowledge amongst which was contact with subject experts.

Prior to the start of the lesson trials, there had been no intention to include support for teachers' subject knowledge in the aspects of early-medieval history covered by the thesis. However, in discussions with teaching staff in all three of the schools, when questioned as to how the resources could be improved, they all suggested some form of background information to widen their knowledge. The teachers were in agreement that the format of the A3 sheet on the Sigurd and Fafnir episode (Figure 17) was a useful aid.

7.1 The stone sculptures featured in the resources

In this section a short literature review of the sculptured stones used in the resources is followed by an explanation of the specific pedagogic potential the resources seek to exploit.

7.21 The Halton Cross

In 1890 the Reverend W. S. Calverley first saw the remaining stump of the cross in the churchyard of St Wilfrid's, Halton (Figure 4) and an assemblage of stones recovered by Rector Samuel Hastings around the time of the destruction of the Georgian church, some fourteen years earlier (Calverley,1899). The Georgian church was itself a replacement of a previous building, of which only the Elizabethan tower survives. Just as he had been the first to identify the bound figure of Loki on the Gosforth cross, Calverley was the first to identify — on the east and north faces — the elements of the Sigurd narrative that he knew from the Völsunga Saga.

Figure 4: St Wilfrid's Church & Cross, 1876. Anonymous photograph. Red Rose Collections, iBase ID 234114. © 2019, Lancashire County Council.

With Hasting's ready agreement, he made drawings for a reconstruction of the cross to incorporate the remaining fragments judged to be from the missing upper section. He appears to have calculated the original height of the cross based on the degree of inward taper on the sides of the remaining stump, together with measurements of the surviving fragments. The resulting construction (Bailey, 2010), though not to Calverley's complete satisfaction, is a convincing attempt. It measures 3.65 metres from the foot of the base to the top of the cross head.

The need for this reconstruction work dates back to 1635 when the then incumbent, Richard Jackson decided that the top section of the cross should be removed so that the remaining stump could function as the base for a sundial 'Carbo' (1799, p. 833). This was not an unusual practice; a similar clerical desire to be able to tell the time on those occasions when the sun shines on the England's north west coast, seems to have led to the felling of another cross in Gosforth (Carbo, 1799, p. 833). The Halton stump was drawn several times in the years following its truncation. One of these depictions, by Edward Jones in a Regency period traveller's guide (Clarke, 1811, p. 122) is used as an overlay in the film cited above. It required no alteration other than cropping and equal-axis scaling to layer the drawing over the film of the lower section of the cross. The early artists all chose to favour the west side as their viewpoint, probably as conjectured below in reference to the 18th century drawing of the Gosforth Cross, because it contains

the most recognisably Christian element of iconography, the crucifixion. It is also by far the most deeply carved side.

All analysis of the meanings on the remaining pieces must be tempered with the knowledge that they are being viewed in the absence of the context several square metres of lost carvings. Despite this, there are two sides of the stump about whose intended meaning we can be confident.

Calverley's reading of the east and north faces of the cross as depicting Sturluson's written versions of the Sigurd and Fafnir narrative, has not been challenged since. Disagreements, such as they are, centre on small details such as Bailey's description of Fafnir's heart as being in three slices. This is not visible in the scan made for the film neither is it referred to by Calverley, nor is it present on Collingwood's drawing, other than as suggestion of vertical scoring that does not fill the full height of the organ. The Sigurd explanation is supported not merely by the clear links between Sturluson's account and Halton sculptor's richly detailed depiction. Further corroboration is supplied by the way other stone sculptures record many of the same incidents and occasionally supply extra incidents that also fit the story. Kopár (2012) gives a full summary of the insular examples.

In contrast to the generally accepted view of the east and north sides, there is less academic certainty about the markings on the west side, and very little written about those on the south. Both of these sides are divided into upper and lower panels. Bailey argues that the central figure in the upper west panel is an angel, based on an interpretation of 9th century Anglo-Saxon cross shaft fragments from Halton (Lang, 2019i), though he admits that the depiction of the angel's wings is 'less angular'. This interpretation is hard to reconcile with the 3D image viewed from the side (Figure 5). The horizontal lines which, following Bailey's suggestion, would represent the upper edge of the angelic wings are at right angles to what would be the sides which both drop vertically, parallel to the panel edges. As the subject's diminutive legs both seem to be bent at the knee, it is difficult to read this as anything other than a figure sat on a high-backed chair. Two

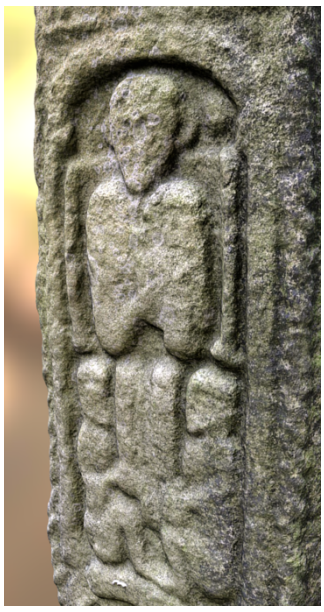


Figure 5: Halton Cross, upper west side panel, 3D model (Lang, 2017c).

smaller human figures are crouched side-on below the main subject of the panel. Bailey describes these as ‘possibly naked’, though the original painted appearance of the sculpture may have conveyed a different impression.

The lower west side panel shows an empty cross with two figures standing at either side on huge chalices. The film made for the lesson materials (Lang, 2017e) suggests that, just as the sections in the east side represented elements in the same story, it is quite possible that there is a narrative connection between the two panels on the west side. Perhaps the two figures below are apostles by the cross following the removal of Christ’s body, and are shown again in the upper panel at the feet of the Risen Christ in heaven. Subsequent reading of the literature has shown that March had arrived at a very similar idea in the 19th century, though he thought the two panels to be showing Christ in heaven with two disciples simultaneously whilst a different pair of his followers were still on earth (March, 1891, p. 64).

The film argues that this reading of the west side can also suggest a deeper significance to the south side carvings than hitherto offered. If the west side shows the blood-sacrifice of Christ in the lower panel, and in the upper scene, the eternal life which Christian belief results from this death, then there is a direct symbolic link in the content of the neighbouring images. The south side also contains two panels each equal in height to those on the west. The lower south panel is filled by a vine-scroll — the symbol dating back to the fourth gospel’s description of Jesus being the true vine, and the upper panel shows two interlacing, or knotwork, patterns which with their lines lacking a beginning or end can be taken to symbolise eternity. The most vulnerable aspect of this argument is the difficulty in identifying the lines in the upper section as continuous, quite possibly ends have been left unjoined by the sculptor, though if so, this could have been remedied during the painting process.

Answers to the question of why Norse and Christian narratives are side by side on the same stone have tended to concentrate, as with the Gosforth Cross, on the religious iconography and any similarities in the symbolic meaning between the narratives they may have been meant to illustrate. The fact that even now, as for Calverley, March and the other first interpreters of the iconography of these sculptures, a presence of more than one faith’s iconography appears to be an issue of surprise, is a reflection of a

Western view of religion. The absorption of pre-Christian traditions into European Catholicism is well-recognised, not least by the Catholic Church itself (Filotas, 2005, pp. 179-184). Further afield, the sharing of religious imagery across Buddhist, Jain, Hindu and Sikh traditions in India until recent times is well-documented, for example by Oberoi (1994, p. 418). Nonetheless, it is unusual in its contemporary insular setting: a mixture of pagan and Christian imagery is not overtly present on Anglo-Saxon stone sculptures, though the carved whalebone Franks Casket displays a widely eclectic palette of mythological references (Abels, 2009). The reason for the 'equal billing' of Saga and Gospel on the remaining section of the Halton cross is worth exploring. As was discovered during one of the trial lessons, this is also a question that can even occur unprompted to primary school children.

The most obvious biblical character to which Sigurd can be likened is the Saint and Archangel Michael. Michael is referred to in two passages of the Hebrew bible, both of them from the Book of Daniel (Dan. 10: 13-31, 12: 1). He is mentioned in what is generally regarded as one of the earliest texts of the New Testament, (1 Thess. 4:16) another later Epistle (Jude. 1:9) and most importantly in this context, in the Book of Revelation (12:7) where during the Apocalypse, he leads the company of angels in a fight with a dragon. His role as a military symbol of the fight with evil is important in Orthodox Christianity, where he is usually an important presence on the iconostasis at the front of the church, and in Catholic Christianity, where is also a frequent subject of religious art, he is seen as a defender of the Church. Byock (1990) notes that Michael was frequently portrayed on portals and tympana in the earliest Danish churches, whilst the equivalent protector-figure in surviving examples from six Scandinavian stave churches is Sigurd.

The link with Michael is was also made by Richard Bailey (1980) one of the supporting examples he gives is the Sigurd episode carved on a cross from the Manx church dedicated to St Michael.

Kopár (2012, p. 174) in a table of possible correspondences between 'Norse mythological and heroic elements in Christian context' lists three episodes from the Sigurd narrative in the Völsung legend. In addition to the above parallel with Michael the dragon-slayer, she notes; the similarity with the opening chapters of Genesis with the involvement of a serpent in the acquisition of hidden knowledge associated with a tree, and the Eucharistic meal with the 'miracle of the blood; initiation where special knowledge is gained'. What seems missing in Kopár's account, as with the other writers on early medieval sculpture

cited, is the issue of soteriology. The link between soteriology and eschatology will be discussed further in the context of Ragnarök and the Gosforth Cross.

In the Völsung narrative, Sigurd is saved (albeit for a short time) by drinking magic blood; and sorcery or *seiðr*, as Price (2002; 2019) and others have argued, was clearly a real and powerful part of the Norse mindset. Though the artefact Price sees as the preeminent piece of a sorcerer's equipment, the staff (2019, p. 132) has not been found in mainland Britain, examples have been found in Orkney, Ireland and the Isle of Mann, and it seems that even if seiðr was not actively practised to the same extent as in the Scandinavian homeland it seems unlikely that Norse settlers would completely lose a belief in the casual efficacy of magic the instant they disembarked from the longboats. The Christian soteriological belief is that the blood of Christ saves believers from eternal torment in the afterlife. For most people brought up in a nominally Christian culture, acquaintance with this idea from an early age dulls awareness of just how bizarre the concept is likely to seem to an adult meeting it for the first time. Though the later medieval church restricted the drinking of eucharist wine to the clergy , it was still a religious action performed by laity throughout the first millennium (Catholic Encyclopedia, 2019). The early medieval Scandinavian being introduced to this ritual for the first time would already have a mindset attuned to magic, and therefore to the acceptance of the practice.

A common feature of academic writing on this subject is the impression that any elements in Snorri Sturluson's written versions of the Norse mythology and sagas that echo Christian doctrine or narrative, must be later redactions either by Snorri himself or earlier Christian interpretations that he has heard: McKinnell (2008) gives a summary of the main arguments. There is no need for this to be argued with regard to the blood-magic episode under discussion here. Firstly, Sigurd sucking his thumb is one of the most common elements in graphic depictions of the narrative dating back to pre-Christianised times. Secondly, rituals involving blood magic are found across many religious traditions. It is present in many places in the Hebrew bible such as the ritual throwing of blood on the altar by the priests (Lev. 17:6). It plays a central role in some popular Tantric Hindu practice (Urban, 2001), and was famously a key element in many of the religions of pre-Columbian Central and South America. Therefore, the Sigurd narrative and

Christian eucharist could serve as a double-facing confirmation; their similarities offering a mutual validation of their magical reality.

In this context it should also be noted that the demarcation line between Sagas and Mythology is noticeably porous, particularly in the Völsunga saga. Sigurd is not merely descended from Óðinn, through Sigi, Rerir, Völsung and Sigmund, but it is the disguised Óðinn who arranges for Sigurd to own the horse Granni — a descendent of his own eight-legged mount, Slepnirr. The episode in which leads to the death of Fafnir and Reginn with Fafnir starts, like the death of Baldr, with the actions of one of Óðinn's sons, Loki. In company with his father and another of his brothers, the god Heimdalr, Loki kills Fafnir's brother Otr who has shape-shifted into the form of an otter.

A rock carving of the story from Ramsund, Sweden is also used in the lesson (Figure 17). It post-dates the Halton Cross by around a century but shares many of the details though they are cut in a line-drawing style. The runic inscription on the lower drawing of Fafnir's body records the construction of a nearby bridge as an offering by a female relative seemingly as an act of indulgence to curtail a relative's sojourn in purgatory. Again, there appears to be a soteriological link.

7.22 Pedagogic use of the Halton Cross

The Halton Cross was incorporated fully into the resources during this research having been a minor optional extra of the original lesson plan for the RSA project lessons, which began with an exercise focussed on the incised rock in Ramsund, Sweden which illustrates the same story as that depicted on the east and north sides of the Halton Cross (Culture Street, 2016). In preparation for the present research, the first photogrammetric model of the stone sculpture was made (Lang, 2017c) and incorporated in a short film (Lang, R., 2017d).

The learning outcomes for the children centre on analysing the markings on the east and north sides of the cross and identifying their similarities and differences with the later Swedish stone. They also include reflections on what the narrative tells us about the Viking diaspora culture.

7.31 The Gosforth Cross

This dissertation is the direct result of an RSA Fellowship project started in 2015. Its purpose was to produce a batch of online learning resources and lesson plans for Primary school teachers to support depth studies of the early medieval period. The focus was a singularly important Viking Age stone sculpture; the Gosforth Cross. Prior to this project there had been no set of learning resources for school age children that made any reference to the work. These lesson plans and learning resources were revised during the present research, in line with the greater focus on the use of 3D models, postgraduate archaeology studies and wider reading on education theory. They then went through the further development process outlined above in Figure 2.

In its home setting, the 10th century Gosforth cross is an impressive object[9] (Bailey & Cramp, 1988). In a time and place when the demarcation between craft and art existed neither in language nor in practice, an unknown sculptor created a 4.43-metre-high masterpiece. The sculpture emerges from the socket in its three-stepped base as a cylindrical unmarked column onto which a pattern fades in from around one metre up. This pattern, (Figure 6) described by Bailey (1996, p. 87) as a form of ring-chain, may represent tree-bark, but it also has a passing similarity to the tegulation found on the sloping tops on some hogback stones (Figure 7). It may be that once a sculptor had mastered the creation of a complex pattern, the skill may have been repurposed in other settings.

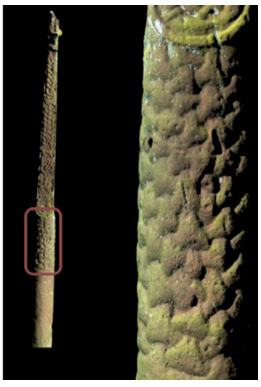


Figure 6:
Gosforth Cross.
Still from film.
Lang (2016b).

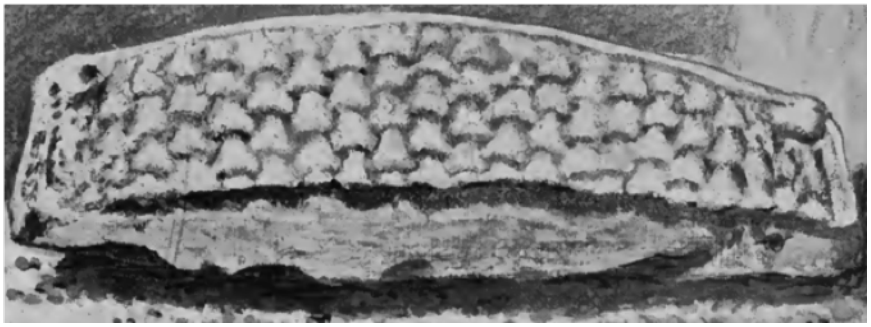


Figure 7: Crosscannonby Hogback. Drawing by W. S. Calverley (Calverley, 1888a).

[9] The copy in the Victoria and Albert Museum goes unnoticed by most visitors, dwarfed by the huge plaster casts of Trajan's column.

The cylindrical column segues gracefully into a narrower trapezoidal section that tapers over its 207cm length to join the neck of a cross head very similar to earlier examples on high-crosses associated with Anglo-Saxon monasteries. The faces of this portion of the shaft are carved with designs that confused the pseudonymous antiquarian 'Carbo' (1799, p. 833) who produced the first published description and drawing of the cross at the end of the 18th century. It was not until the 8th of July,1881, that the Norse mythological content illustrated by the carvings on the shaft was first recognised in modern times, when the Reverend William Slater Calverley identified on its west side (Figure 8) the figure of Loki, bound by the gods as a punishment for his part in the death of Baldr (Calverley, 1883, p. 373). Loki proved the key for Calverley and Dr Parker, his companion on that summer morning, to unlock links with Ragnarök.

Figure 8: Gosforth Cross, west side. Cropped still from film (Lang, 2016a)

Recognition of the importance of the Gosforth Cross quickly spread, and in the year following Calverley's discovery, the South Kensington Museum sent Sergeant Bullen of the Royal Engineers to make the plaster cast still on show in what is now the Victoria and Albert Museum (V&A, 2019). Sergeant Bullen's Victorian Virtual Reality Gosforth Cross provides a useful supplement to the early drawings made by Calverley, Parker, Petersen and Collingwood (Collingwood 1899: 139-158). No other surviving piece of early medieval stone sculpture, or any other art form, contains such a quantity of illustrations of the key event in Norse eschatological myth and from Calverley's discovery onwards, this aspect of the cross has been the prime focus of academic research. The earliest lengthy written record of the events of Ragnarök was created by Snorri Sturluson in the *Gylfaginning* section of the Prose Edda, an English translation of which had been made available in the first half of the nineteenth century (Dasent, 1843). Despite the gap of three centuries and almost a thousand miles between the carving of the cross the writing of Snorri Sturluson's account, there is a striking similarity between the two in their treatment of key mythological events. The exact correspondence between the Icelandic document and the Gosforth carving is seen most clearly in the punishment of Loki described below and in the account of Víðarr's revenge on his father's killer, the giant wolf, Fenrir. The significance of these correlations in the context of the extent to which Sturluson's Prose Edda represents a Christian redaction is examined further in the discussion section below.

Figure 9: Detail from east side of the Gosforth Cross with and without coloured layers. Photograph edited by R.Lang.

En þegar eftir snýsk fram Víðarr ok stígr öðrum foeti í neðra kjöpt úlfsins…Annarri hendi tekr hann inn efra kjöpt ulfsins ok rífr sundr gin hans, ok verðr þat úlfsins bani.

Instantly, Víðarr leaps forward and stamps on the wolf's lower jaw…With one hand he seizes the wolf's top jaw and rips his mouth apart — and that's the end of the wolf.

Figure 10: Extract from *Gylfaginning* 51. Text from Byock (2015, p. 62), translation R. Lang.

From the first antiquarian commentators to the present day, the presence of a deliberate ambiguity in the selection and design of these illustrations has been noticed. Many of them can be seen to function as an illustration of events in the last book of the Christian bible and the Matthean version of the 'little apocalypse' (Matthew, 24 & 25). Bailey, in his latest and most concise summary of this argument cites; earthquakes, darkness, cosmological disturbance, war and rumour of war, and a trumpeting figure, as being common elements to the Ragnarök and Christian myths (Bailey, 1996, pp. 88-9). In addition, he draws attention to the likely significance of the presence of four of the horsemen portrayed on the cross, the same number as the biblical 'horsemen of the Apocalypse'.

Awareness of the prophecy of an Apocalypse was more widely spread amongst Christians a thousand years ago than it is today, where it is primarily a concern within elements of the more biblically conservative wing of Protestantism. Throughout medieval Christianity, as with the theologians of the early church, the Apocalypse was seen as a continuation of the Easter narrative and closely tied in with soteriological and eschatological concerns. As Bynum and Freedman (2013) argue it is important to attempt to understand the believer's actual beliefs, rather than apply a modern taxonomy originating in present-day religious thought, "Recent scholarship has tended to treat separately concerns that both medieval intellectuals and ordinary people would have seen as closely linked: death, the afterlife, the end of time (whether terrestrial or beyond earth), and theological anthropology or the theory of the person" (Bynum and Freedman, 2013, p. 1).

Perhaps the most impressive evidence for the crucifixion–Apocalypse link in the early medieval mind-set is to be found in the Anglo-Saxon poem The Dream of the Rood, where in the space between lines 100 to 105, Christ goes from death on the cross to involvement in Doomsday (Hostetter, 2017). The most similar insular carving to the Gosforth Cross, in terms of its combination of Christian and Norse elements, is the remaining section of the Halton Cross, which may well also be concerned with soteriology (Bailey, 2010) .

Even before Lanternari (1965) drew particular attention to the link between apocalyptic faiths and societies under stress, the beliefs in an eschatological scenario that promised believers a future world abundantly filled with all they lacked in the present was not unrecognised. The post-Ragnarök apocalypse world foretold in the Völuspá, a place where 'fields will grow unsown' and golden playing pieces be found in the grass (Page, 1995, pp. 210-211) has counterparts in many religious traditions.

In the wider contest of Religious Studies, the presence of a link between Christian Apocalypse and Ragnarök on an early medieval stone sculpture in a community of newly arrived Norwegian-origin settlers recently abruptly evicted from Ireland (Griffiths, 2015,) is not therefore surprising.

Academic study of the cross, following the contributions of the Calverley, Collingwood and their contemporaries, was surprisingly limited until Knut Berg's important mid 20th century study (Berg 1958). During the intervening period some work had gone into trying to make the figurative panels fit into preconceived theories about mythology, such as Reitzenstein's attempt to use them as evidence of a gnostic origin for Christianity (Reitzenstein,1925) and A.B. Cook's (1914) interpretation of it as a 'Christianisation of the Phrygian Tree Cult'.

The largest body of work on the Gosforth cross since Berg has been that of R.N.Bailey. His 1993 Toronto lectures summarise his position on the purpose and intended message of the cross as being to show how the pagan mythology can be employed to celebrate the beliefs of Christianity and how it shared some narrative elements (Bailey, 1996).

From Calverley to Bailey, then, the underlying assumption has been that a religious motivation was a major reason for the existence of the Gosforth Cross, and discussions have revolved around the intended meaning of individual segments of mythico-religious symbolism and the overall message they convey.

Late twentieth and twenty-first century scholarship has stressed the importance of seeing early medieval insular stone sculpture as being a socio-economic phenomena, for example in investigating their relation to known trade routes (Langlands & Reynolds, 2011). This can be something of a circular argument, as the creation of the major sculptures required a degree of wealth, and sources of wealth are usually on trade routes, either because they grow up on an existing route, or attract new trade routes due to factors such the discovery of valuable mineral reserves.

The most striking new theory in the present decade was made by Miller, who in her Doctorate thesis (2012) identifies clear evidence that the angle of the sandstone deposit layers does not run vertically, as is the normative practice in monolithic upright early medieval structures such as high crosses (Figure 10). Instead, on three of the sides, there are visible signs that reveal the layers to be at an angle Miller measures at approximately 15 degrees to the vertical from the foot of the east to the north of the west sides. The evidence is at its clearest on the upper section of the north face (Figure 11), but is also strikingly present across the face and neck of the gagged wolf on the upper south side and the top of the undecorated column section on the west.

Figure 11: Vertical sediment layers on eroded 10th century sandstone cross ('*Penrith 05'*). Stills from film (Lang, 2019d).

Figure 12: Gosforth Cross, Sediment layers 15° from vertical. Stills from film (Lang, 2019d).

Carving a high cross at an angle to the vertical layers requires starting the process with a larger block of stone than that necessary for a cross carved at a vertical angle (Lang, R., 2019d). This is because sandstone was historically quarried by hammering wide-bladed chisels into the rock along the line of the deposit layers. Miller gives two suggested reasons for this apparently uneconomical decision on the part of the sculptor; avoidance of shedding unintended stone when chiselling combinations of vertical and horizontal lines, and diminishing the risk of later deterioration of the carving by water ingress down the vulnerable vertical bonds between layers. The second of these problems would be unlikely to manifest itself during the lifetime of the sculptor whereas the former could have an immediate reputational and/or financial impact on the carver, therefore the risk of accidents during production would seem much the most likely motivation. Miller cites three other examples of sculptures east of the Pennines cut at a similar off-vertical angle; *Brompton 10*, *Sockburn 5* and *Coniscliffe 6* and argues that their similarity in execution combined with the orientation of the stone suggests the 'Gosforth Master' was either the sculptor or had spent time learning his craft with their maker. Though Miller visited the sites referred to above, her thesis, written in Toronto had to rely on desktop research using the CASSS volumes covering the northern counties. All these early volumes used monochrome photography. Had colour images been used with in the production of volume 2, the cross-shaft section labelled 'Great Clifton, Cumberland' would have leapt to the eye as qualifying to join this small assemblage. *Great Clifton*, actually at St Luke's church Little Clifton, is an extremely rare example of an early medieval stone sculpture carved from a block cut across two distinctly coloured strata of rock (Lang, 2017d).

Another focus in contemporary writing is on the extent of cross-cultural influences and fusions in the early medieval period not just in the regions bordering the Irish sea, but between the Picts, Irish and Northumbrians (Geddes, 2019).

It should also be noted that there has been a renewed interest in the religious aspect of Viking culture amongst archaeologists (Andrén, 2014) and in the process of the conversion and Christianisation of the Vikings (Garipzanov, 2014; Winroth, 2012) – in some respects a return to the concerns of the late Victorian antiquarians.

7.32 Using the Gosforth Cross as an educational resource

The RSA materials already used Bailey's insights on the religious aspects of the cross. Both Miller's theory about the technique of the Gosforth sculptor and the greater emphasis on the open-trade of artistic ideas found their way into new learning resources for the trial lessons at the third school.

Several reasons had prompted the choice of the Gosforth Cross as the subject of the RSA project. The presence of Bullen's 1882 scan in a London Museum offered the possibility of working with contrasting schools in London and Cumbria, and the lack of any existing school-age learning resources together with the ENC's requirement for depth studies all gave reason to believe there was a need for such materials. An additional factor was the presence of Loki on the sculpture and his standing in popular culture. The three Marvel/Disney Thor films have been given UK age ratings of 12, 12A and 12A respectively (BBFC, 2010; 2013; 2017). An original assumption that despite these ratings, many primary age children had seen at least one film was confirmed during the RSA project. Though the Thor franchise films have hardly infringed Snorri Sturluson's intellectual property rights, at least they have made many children aware of names of the main protagonists in the Ragnarök narrative. A surprising number of pupils also reported having seen the Jim Carrey vehicle, The Mask, which involves the lead character becoming possessed by Loki through the means of the eponymous mask, computer-generated imagery and unrestrained acting.

As a result of the three most recent of these movies, Loki seems to have emerged as modern children's favourite member of the troubled troupe of Norse deities. Even without this reworked presence of Scandinavian myth in modern culture, making use of the best surviving Viking-period illustration of the Ragnarök story as a means of engaging pupils in the history of the early medieval period appeared to be a sound strategy. The intention was to try out the learning materials in contrasting schools, one in London, the other in Gosforth, Cumbria, and use pupils from the schools to provide voice-overs for films that could be incorporated into the second of two lessons (Lang, 2016a; 2016b). The London version was partly filmed in the Victoria and Albert Museum's Cast Hall 2.

The object in making the films was to produce a resource that could be shown at the end of lessons about the Gosforth Cross, or used in lesson plans of the teacher's own devising. The act of making the films had no planned learning outcomes for the children involved, though the Camden pupils were given the opportunity to make their own short script for a reedited version that was shown to a whole school assembly. The children from both schools also clearly enjoyed the experience.

The films were designed to set out a parallel reading of the cross from the perspective of Norse mythology and of tenth-century Christianity; particularly with regards to soteriology and eschatology, and to do so in a way that would be accessible to their young audience. Their purpose was to foster an understanding of the sophisticated level of thought and high level of skills behind this product of a diaspora negatively stereotyped by the wording of the ENC.

In order for the films to retain children's attention, it was important for the details on the cross to be related in the context of narratives as much as possible. As mentioned above, the subject matter of these stories – their heroes, monsters, tricksters and comedy moments – are also popular with school students. Far from being a constriction or a 'dumbing down', it can be argued that the resulting phenomenological understanding it offers is useful. As the cross's intended audience and its likely commissioners, would have been settlers comprising men of Norwegian patrilineal origin (King, 2015) as well as some women probably of Irish Christian heritage (Jesch. 2015), their readings of the cross would more likely have centred on the illustrations of saga stories and their similarity with existential Christian themes, rather than art-historical matters such as comparisons with volutes in carvings on the other side of the Pennines. Therefore, by concentrating on the storylines and 'bracketing out' concerns about Carolingian precedents, we may be getting closer to an awareness of how the carvings were perceived by its tenth century viewers, some of whom would presumably themselves have been children.

The only aspect of the cross where the film's argument for a deliberate Christian–Norse myth parallel may be contentious is in the Crucifixion scene on the East side. However, given that the carver would have been aware of the death narratives of Baldr and Christ; had he not wanted the scene to be ambiguous,

he only needed to put the central figure on a cross if the Crucifixion was intended, or, if the intention was just to portray the saga episode, the weapon could have left Hodr's grasp. Either would have been well within the ability of the cross's creator and required few, if any, additional chips from the chisel. Equally importantly, in the context of the mythological narrative, the death of Baldr is the reason for Loki's punishment; his earth-rumbling escape from which is the catalyst for Ragnarök. It would be odd to miss the chance for it to be represented. Both Kopar (2012) and Miller (2012) find the most likely candidate for a Norse reading of the figure to be Oðinn, who sacrifices himself on Yggdrassil and is also pierced by a spear, though to gain knowledge of the future not to hasten death. However, the direct causal links from the death of Baldr to the punishment of Loki, and from his escape to Ragnarök seems particularly compelling.

The pedagogic use of Miller's work on the angle of the stone was, even by the third trial lesson, rather limited. A short film was made to try and convey the argument (Lang, 2019d). It is still work in progress as a lesson resource and needs a short interview with a stone sculptor giving his or her insights on the theory and a practical demonstration. However, it already provides a visual impression of why the process of cutting on an angle would require a larger block from the quarry, and how the sandstone rock was formed. It also promotes an understanding that the cross may have been technologically sophisticated in a way that remained unobserved for a hundred and thirty years of direct observation by archaeologists, historians and art historians. Additionally it goes someway to redressing the unfortunate impression created elsewhere in the materials that not only were Vikings all male, by so are the experts who study them.

7.41 *'Penrith 11'*

One probably 10th century stone sculpture was included in the project despite having no direct connection with Norse mythology. It does however provide the potential for learners to use 3D models to find evidence not previously documented in academic literature. It also enables them to enact a directed form of archive research an import element in historical practice, and to investigate the way design compositions were passed from one medium to another and between different cultures.

In a glass case in Kendal Museum, Cumbria, is a carved limestone plaque, '*Penrith 11'* (Figure 12), (Bailey and Cramp, 1988; Lang, 2018). It depicts a composite of two incidents from the fourth gospel. The crucified Christ, while still alive, is offered a sponge soaked in wine vinegar by a Roman soldier. In post-canonical tradition the soldier is known as Stephaton. Another soldier, traditionally called Longinus, is depicted piercing Christ's side with a spear after his death (John: ch19 vs 29 and 34). This conflation of two events into one image can be found in early Roman frescos such as that in the Theodotus chapel in Santa_Maria_Antiqua, Rome dated to the first decade of the 8th century (Figure 13); (Folgerø, 2009).

Figure 13: Limestone Plaque. Kendal Museum, Cumbria. On permanent loan from Abbot Hall Art Gallery, Kendal. Photograph, R.Lang.

Figure 14: Fresco. Santa Maria Antiqua, Rome. Public Domain.

The plaque measures; h. 30 cm x w. 32 cm x d. 6 cm, and would have originally been wider as Christ's left hand is missing. The frame is absent from the right and bottom edges. An additional triangular piece approximately 8.5 x 6 x 10.5 cm has been removed from the bottom right corner. The back face of the plaque is uncarved apart from what Bailey and Cramp describe as a 'hastily carved graffito of a boar' that they consider dates from after the plaque's removal from its original setting. Kleinsmith (2011) has since argued that the boar has Celtic symbolic significance and is contemporaneous with the carving on the front, which Bailey and Cramp date as 'Probably tenth century'.

There are three features of the carving that render it of particular academic interest, all of which offer a potential use in lesson resources.

7.42 Polychromy

The plaque offers some of the best archaeological evidence in the whole of the Anglo-Saxon Stone Corpus of the practice of painting stone sculpture in the early medieval period. Though the paint is difficult to see behind its reflective glass case in the museum, the 3D scan (Lang, 2018) clearly shows the areas identified by Bailey and Cramp on the front face of the sculpture; the black gesso, green wash, orange wash, darker red paint on the front, and the thicker green patch on the top of the plaque. It also reveals other areas, not commented on by Bailey, such as the spot of red paint below the left eye of the soldier at the left side of the scene and the red colour on the tunic of Longinus below and to the left of his spear, though this latter may be due to a misidentification by Bailey of the two principle soldiers.

Given the outdoor location of many early medieval stone sculptures and the treatment of indoor sculptures during the Reformation, it is unsurprising that so few examples like *Penrith 11* exist. Almost forty years ago, in his influential Viking Age Sculpture in Northern England, Bailey stated the importance of this issue clearly Bailey. He pointed to the practice on stone carvings in Scandinavia, on the eleventh century sarcophagus of a member of Cnut's retinue in the crypt of St Paul's, London and on eleven other pre-conquest pieces in England. He reached the conclusion that there were 'sufficient survivals to assure us that colouring was the normal treatment' (1980, pp. 25 - 27).

7.43 Evidence of Skeuomorphism

Figure 15: Brass Crucifixion plaque from Clonmacnoise. National Museum, Dublin. 2D Digital reconstruction, R.Lang.

Bailey (1988) identified as a likely source for the image, an Irish metalwork crucifixion scene similar to the small corpus of copper-alloy pieces identified as such by Harbison (1980). The pieces in that group show a large figure of Christ with a diminutive pair of angels — possibly Cherubim — together with Stephaton and Longinus, who are also shown at a smaller scale than Christ. The nearest surviving example to *Penrith 11* in the arrangement of its iconography is the Clonmacnoise plaque acquired by the National Museum of Ireland in 1935 (MacDermott, 1954). Unlike the other items in the corpus, only the Clonmacnoise piece and a lost plaque from County Mayo,

show Stephaton on the left and Longinus the right sides of the plaque. The remainder of the assemblage follow the practice found in other contemporary and earlier media such as Figure 13, but unlike the Clonmacnoise plaque, both soldiers are depicted in a semi-kneeling posture. A point not mentioned in the CASSS entry on *Penrith 11*, is that since the Council of Trullo in 692 urged the presentation of Christ's suffering and death in human form rather than using the symbol of a lamb it has been standard practice for crucifixes and other representations solely of the dead Christ on the cross to depict the chest wound on the right of his body (Clerus, 2001). Consequently in scenes depicting Longinus he is almost invariably shown on Christ's right. Thus, though not actually heterodox, the portrayal in Penrith11 and Clonmacnoise is a very unusual break with tradition. As late as 1864, Édouard Manet incurred the strong displeasure of the Catholic Church in France by depicting the fifth wound on Christ's left side (Gurewich, 1957).

The similarities between the two pieces suggests that one of them must have been influenced by seeing something very much like the other. Bailey and Cramp suggest the arrow of causation must point from Ireland to Cumbria. The reason for this conclusion lies in practical constrains imposed by the medium. The joining of the hands to the frame would be vital in preserving the stability of such a thin piece of metal, recently identified as brass[10] (Griffin, 2013, p. 301).

7.44 Provenance

The CASSS entry traces the documentary evidence for the provenance back to the catalogue of a sale of items from Lowther Castle at Maples & Co in 1947. Noting the painted writing on the on obverse 'LC 362' and 'L.C./80????4' (sic), and 'Penrith/Cumberland' they conclude, that 'LC' is likely to be an abbreviation for Lowther Castle, but that this cannot be confirmed due to the absence of a catalogue of the Lowther Castle sculptural collection (Bailey & Cramp, 1988, p. 140). They find that 'Penrith/Cumberland', 'presumably indicates original provenance' and in the Corpus category of 'Church Dedication' they give 'St Andrew', the Parish Church of Penrith, as they do for the other 10 items in that section of the corpus. Bailey & Cramp's conclusion is sound based on the information available, but in preparing this dissertation a number of additional pieces of evidence came to light that suggest an alternative provenance.

[10] The alloy composition; Cu 74.12, Zn 23.60, Pb 1.19, Ag, 0.08, places it in the category of brass made for its gilded appearance rather than its strength – the more robust 'gunmetal' brass having a proportion of around 30% Zinc.

The first problem with a Penrith origin for the plaque is the stone from which it is carved. The other Penrith pieces in the corpus, like St Andrew's Church itself and almost all of the pre-20th century buildings in the town including the Norman Castle, are built from red sandstone. There has never been a local shortage of the rock and a quarry is still in full production a few miles north of the town at Bowscarr (Cumbria Quarrying Services, 2017). *Penrith 11* has, however, been carved from limestone and as Bailey noted elsewhere (1980) the scholarly assumption has been that the raw material for stone sculptures during the Viking period most often came from a quarry – or remains of a Roman building — near the setting it was intended for. The strong evidence that the plaque was plastered with gesso and painted seems to rule out the idea that limestone would have been chosen for its colour in preference to that of the local sandstone.

Lowther Castle is also on sandstone bedrock and its walls, and those of the church in its grounds, are constructed of sandstone blocks. There is, however, a church that was owned by the Lowther family even closer to Lowther Castle than the family's chapel. Dedicated to St Peter, it is situated on the outskirts of the village of Askham, on limestone bedrock with a large cliff face of the rock plainly visible less than thirty metres away. The present building dates from 1832, but was constructed on the site of a medieval church dedicated to St Kentigern which enters written history in 1240 (British History Online, 2019), though the 13th century document is clearly referring to an already-established place of worship.

Since the second volume of the Corpus was published, an archive of papers from Lowther estate have been made available at Carlisle Public Records Office (National Archives, 2019). They include a handwritten inventory of the four main Lowther family properties, listing; 'Pictures, Prints and Drawings, Miniatures, Articles of Vertu, Bronzes, Statuary, Plate and Curiosities' and dated 1878. Amongst the list of items of 'Articles made Heirlooms by Earl William 2nd', is the entry 'Sculptured stones, found near Lowther Church'. The second Earl had a life-long interest in antiquarian finds and from other entries in the inventory seems to have operated his own aristocratic precursor of the Portable Antiquities Scheme covering what is now Cumbria and some way beyond.

Askham church had been acquired by the Lowther family as part of a purchase of a smaller estate, and they funded the replacement of the dilapidated medieval building with a newer renamed place of worship (British History Online, 2019). This small, unassuming church is a striking contrast with its architect-builder's most famous creation. Sir Robert Smirke, best known for the façade and much of the interior of the British Museum, had already been employed by the family to build the grandiose Lowther Castle. It is not unlikely that instructions would have been given for anything of antiquarian interest found in demolition of the medieval church to be sent over the river and up the hill to join the Lowthers' eclectic assemblage.

7.45 Pedagogic uses of *Penrith 11*

The 3D model of the front of the sculpture made in high resolution with a full-frame camera (Lang, 2018) gives the opportunity for learners to search for the colour on the plaque themselves. There is also the chance to search for similar flecks of what seem to be copper-based green pigment on the 3D model of the cross-shaft from Little Clifton (Bailey and Cramp, 1988, pp.110-111; Lang, 2017).

The learning opportunities presented by the related issues of skeuomorphism and materiality of the brass plaque centre on the learners analysing the similarities and differences between the Irish and Cumbrian pieces, and on considering the need for a thin metalwork product to have stability.

The learning opportunity that suggested itself from these issues around the provenance of Penrith 11, was the notion of presenting groups of children with a bank of information using a summary of the CASSS account, online geology maps, public records materials, extracts from primary and secondary texts to draw their own conclusion in a way somewhat like the 'Fake or Fortune' terrestrial television series.

7.51 Hogbacks

The two earliest written references to the recumbent stones commonly called *hogbacks* are from the 16th and 17th centuries. They describe the sculptures stones at Inchcolm, on the Firth of Forth (Lang, J.T.,1973) and those at Penrith, Cumbria (Calverley, 1899). Both accounts place them in the context of an assemblage including one or more stone crosses and citing local traditions that they marked the burial

place of an important leader. The importance of considering individual hogbacks in their local settings is one that has regained prominence in recent years.

The first written use of the word *hogback* to describe a recumbent carved stone is ascribed by the Oxford English Dictionary to R. S. Ferguson a leading member of the Cumberland and Westmorland Antiquarian and Archaeological Society, writing in 1899 ("hogback, n.", 2019). His approach to the study of these monuments was typical of his time and for many years to come. As objects relating to a rite of passage, they were seen as religious artefacts and that therefore any attempt at explaining their materiality was a task that centred on decoding their religious symbolism (Ferguson, 1899).

It was not until James Lang's monograph, "The Hogbacks, a Viking Colonial Monument' (1984), drawing on much of the work carried out for his master's thesis (1967), that a full study of the assemblage with a catalogue and typology was published. His basic argument on the origin of these recumbent stones is that the wide variation in their shape renders it impossible to identify a single source of inspiration (Lang, 1984). He considered it a form that developed from an existing tradition of recumbent grave covers predating Norse settlement in the British Isles. Nonetheless, he judged the eclectic integration of a wide range of styles in the manufacture of hogbacks to be an indicator of Anglo-Scandinavian sculpture. But, for a more detailed level of understanding, he argued that it was important to consider the 'parochial characteristics' of individual types of the form, rather than, 'to relate the details to mainstream Scandinavian trends during the Viking Age' (Lang,1984, p. 97).

Lang's typology was adopted by the Corpus of Anglo-Saxon Stone Sculpture and published in the 'Grammar of Anglo-Saxon Ornament' (Cramp, 1984) with illustrations on pages xix – xx, and a printed list on page xxi. Unfortunately the lettering of the 'schematic illustrations' and the written taxonomy do not perfectly match; the former providing outline drawings of types labelled a - j, the latter listing a typology ranging from a-k. The first eight drawings illustrate their equivalent descriptions, but the written description of type i, the ' house type' , matches the illustration labelled 'j'; that of description 'j', the 'wheel-rim type', has no illustration; and type k ; 'shrine type', matches the illustration labelled type 'i'.

James Lang gives a brief written description of the distribution of the types, but, to date, there seems not to have been any attempt to plot the locations of hogbacks *by type* onto layers over a base map. The typology is quite generally straightforward to apply, though some examples, such as *Gosforth 04*, can fit equally well, or ill, into two categories. North of the Scottish border, the taxonomy can become severely strained, as is observed below with the example from Inchcolm.

Over the past half century, there has been an increasing awareness of the permeability of the boundary between the Viking diaspora and the other inhabitants of the British Isles. Bailey's identification of the absorption at Gosforth of the design from an Irish metalwork crucifixion is an early example already cited above. The specific implications for hogbacks have also become increasingly recognised. Abrams (2012, p. 36) considers the hogback a product of a Viking diaspora reflecting their commissioners as a 'new generation of patrons … inspired to find original ways of monumentalizing their new identities' that 'drew on local English stone sculpture' as well as absorbing other influences form Ireland and Northern Britain. Abrams also draws attention to the wide diversity in mortuary practice and more general ritual religious action across the diaspora. Given this context, the objection to hogbacks being a product of a Norse diaspora on the grounds of the lack of such monuments in Scandinavia seems of limited merit compared to other reasons that have been advanced. Even more so, when so little first millennium stone sculpture, as distinct from incised rune stones, is found on the Scandinavian mainland.

Recently there has been increased focus on investigating hogbacks as individual objects in the context of their materiality and in their particular settings, within assemblages containing other forms of stone sculpture — as in Gosforth and Penrith —in their local landscape, in existing transport networks, and in the wider context of objects in other mediums produced to meet other requirements (Williams, 2016, p. 69-70).

Williams' work on the skeuomorphic connections between hogbacks and other objects produced in a wide range of materials and sizes in early medieval northern Europe is drawn from the physical evidence of archaeology. He identifies similarities in shape and decoration between the hogback and artefacts made in metal, wood, and bone, ranging in size from an Iron-Age hall to a silver coin about two centimetres in diameter. He is not arguing that the hogback sculptor had all of these 'meshworks of citation' in mind when creating any individual work, but that the commonality of the basic shape and some of the

similarities in surface decoration place the hogback in the context of a fluid and borderless, zone of open-source ideas and designs. This provides a more serious objection to labelling the hogback as specifically a product of the Norse settlers. In this context it is worth noting that this free-trade area included vocabulary as well as designs and that, as Carstens (2015, p. 23) notes, *hǫll*, the Old Norse word for 'hall', seems to have entered that language and to start replacing the older term *salr*, only following close contact with the British Isles where it was the standard Anglo-Saxon term.

With some of the objects Williams includes, the seeming similarity may have originally been a coincidental product of 'form following function'. For example, the shape of the bowed harness is necessitated by the need to fit on the draft animal. Schmidt's experience as an architect, particularly as a designer and builder of a full-scale long-house based on archaeology from Fyrkat and Vorbasse, has also produced insights into the pragmatic reasons for the curvature of the long-house ridge and exterior walls. He suggests the aerodynamic advantages in withstanding 'hurricane force gales' and the need for a steep pitch to ensure shingle roofs were key factors in the evolution of the shape (Schmidt, 1991, pp.156 & 158).

Figure 16: Brompton 17, end view, long side C on the right. Photograph, R. Lang.

One of the aspects of hogbacks on which work remains to done is the manner in which limitations of the medium influenced the final form of the object. The issue of carving rock with vertical lamination raised by Miller (2012) referred to above in the context of the Gosforth Cross, applies not just to high crosses. There has been no published study of the lamination of hogbacks, but based on those encountered in this research, they all appear to have the layers running vertically. This risks the unintended shedding of material from the sides during the process of roughing out and finer sculpting, thus leaving less material on one side of the piece. The apparent evidence of this effect is easiest to see on one of the least technically accomplished stones, *West Kirby 04* (Lang, R., 2019a), where there is a greater volume of stone on the C side than the spectacularly ineptly carved A side, which also has lost a sizable vertical chunk down the lamination line sometime in the years following its original completion, or abandonment. Far more surprising, and apparently unremarked despite its justifiably high status as 'by far

the finest and best-preserved hogback' (Lang, 2002, p. 74), is the lengthways asymmetry of *Brompton-in-Allertonshire 17*. James Lang's description of side A reads simply, 'as side C'. Tellingly, the end sides, B and D are neither described nor photographed in James Lang's CAAAS entry. The cross-section end-view by Holger Schmidt, which Lang had reproduced in his earlier monograph (1984) at the top left corner of page 92 (Figure 17) shows the extent of the asymmetry more effectively than the view that a standing observer would see (Figure 16). Schmidt's plan view drawing in his own monograph (1994) reveals the asymmetry in a more subtle, but skilful manner.

For a sculptor as technically gifted as the creator of Brompton 17 to have failed to achieve symmetry in this aspect of the monument, when the difficult carving of the matching pair of end-beast bears appears so accomplished viewed from the side, seems odd. As Schmidt's other end-view drawings show, the Brompton 17's neighbouring hogbacks in the church are very nearly symmetrical when viewed end-on, as are the hogbacks from other areas that he draws (Lang, 1984, p. 92) with the exception of Gosforth. The most likely explanation for Brompton 17 would seem to be that once the piece was rough-hewn with the ridge line lightly marked out in the middle of the block, the A side was sculpted in detail. Then, sometime during the same process on the C side, a large section of the stone split off on the vertical lamination line, leaving the sculptor the task of compressing the depth of that side's work into a space less than three-sevenths the size (Figure 17). That this trompe l'oeil was accomplished in a way that still goes unnoticed only adds to the respect the anonymous artist deserves. Few critiques of stone sculpture take account of the limitations of the medium – particularly when the rock is laminated like sandstone. Because of that, there can be a tendency to think that the sculptor meant the piece to look like it does, and seek for explanations as to why they intended what they did not intend. Realising the strong likelihood of accident playing an important role can offer a far simpler explanation; a sort of Occam's Chisel.

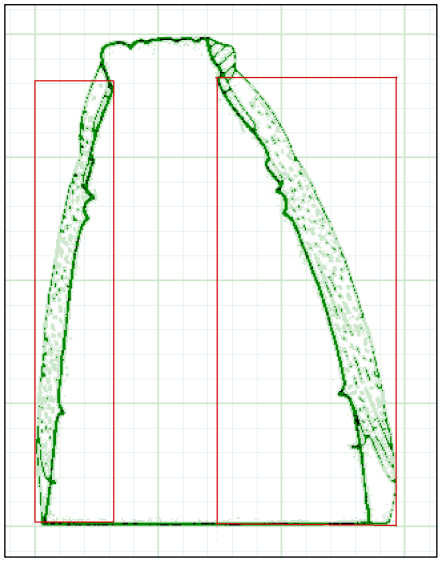


Figure 17: Brompton 17, comparison of sides, — long side 'C' on the left. Schmidt's cross-section drawing (Lang, J., 1984, p. 17) digitally traced in green and marked in red. R. Lang.

The initial reason for the inclusion of a lesson on hogbacks in this research was pragmatic: the apparent availability of a bank of useable online 3D models. As the research progressed, and right up to the final stages of testing in schools, a number of valuable learning opportunities offered by the subject matter became evident, as did children's genuine interest in these early-medieval strange and wonderful objects. The uses identified centred on three aspects as much to do with the academic study of the objects, as with the hogbacks themselves.

7.53 Pedagogic use of Hogbacks: Typology

The earliest idea to crystallise during the work centred on the typology developed by James Lang. This taxonomy offers the chance to help widen children's understanding of the methodologies that can be used to study the past. Such awareness is valuable in its own right as well as supporting one of the aims of the ENC; 'to… understand the methods of historical enquiry, and understand historical concepts such as … similarity, difference and significance.' (DfE, 2013a, p. 1). It also gives primary schools teachers the chance to make connections with, and reinforce, the Key Stage 2 science curriculum, which requires children to; 'give reasons for classifying plants and animals based on specific characteristics' and to develop the skills of 'recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables' [emphasis added] (DfE, 2013b, p. 31).

When work started on selecting the 3D models for the topology exercise, the range of hogbacks available online proved less suited to the task than had been originally thought. A model of the Heysham monument had been made when the idea for this current thesis was germinating (Lang, 2017a), but two more needed to be added during the current research. As there was no representative example on Sketchfab from the area where hogbacks are believed to have first been developed, a model was made of the only piece remaining in Brompton that has three sides completely accessible for photogrammetry (Lang, 2019a). The hogback at West Kirby on the Wirral was also recorded (Lang, 2019b). At the opposite end of the skill spectrum to Brompton, and probably towards the end of the brief timescale in which the genre was being produced in Northern England, the West Kirby piece had already been laser-scanned, but no online model of that process has been made available (Williams, 2016b). Together with three other models made by contributors to Sketchfab community (Monument Men, 2017; Historic Environment Scotland, 2019; Li

Sou, 2017;), the trio made during or in preparation for the research formed a bank of six online hogbacks that showed a range of types and craft competence. The typology used for the exercise is a corrected version from Cramp's 'Grammar' (1984, p. xxi) originating from Lang (1977; 1984), with the addition of the Scottish End-Beast as *type L*. This latter was not included by Cramp as no examples of it have been found in areas within the remit of the CASSS project. However, in this educational context it was impossible to ignore the comedy value for primary school children of James Lang's drawing of what appears to be a baleful hybrid of slug and armadillo, with ill-fitting socks.

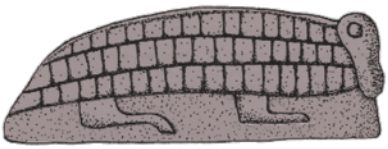


Figure 18: 'Scottish End-Beast Type', drawing (Lang, J., 1984, p. 100). Reproduced by kind permission of the Institute of Archaeology, University of Oxford.

7.53 Pedagogic use: Evaluating theories

The second idea was sparked by the variety in academic views on the causation and purpose of the hogback. Again, this gives the opportunity to deliver an aim of the ENC, to; 'discern how and why contrasting arguments and interpretations of the past have been constructed' (DfE, 2013a, p. 1). The intention was to summarise in an image-rich and simple bullet-point format, two contrasting theories on these issues. The pupils would then work in groups to evaluate the views as presented in the summaries.

Of the academic contributions made over the past three decades, the two contrasting ones that best seemed to meet the needs of the project were those of James Lang (1984) and Howard Williams (2014; 2015; 2016). At the core, the approach of the two writers is closer than would appear at first sight. As described above, both authors stress the importance of studying individual geographical instances of hogback creation rather than ascribing the whole varied collection to the product of one ethnic group. The title, 'The Hogback: A Viking Colonial Monument', gives a more absolutist impression than the subtleties of Lang's monograph merit. Nonetheless, it was possible to attempt a simply-worded summary of contrasting interpretations that offered enough material to learners in an accessible form without distorting the authors' original meanings.

A third bank of materials was prepared in a similar format. The intention of this additional component was to present learners with information that could be used to support a case for possible Scandinavian influences on the design of the hogback, for example, the cultural importance of bears (DuBois, 2012).

A map was also created overlaying the distribution of place names in Britain and Ireland that have Norse elements, and the distribution of hogback stones (Figure 42). Data was obtained from the University of Nottingham's 'Key to English Place-Names', via the British Museum's interactive map made for the 2014 BP 'Vikings: Life and Legend' exhibition (British Museum, 2014) and from the Hogback distribution map in Williams' chapter (2015, p. 246). This provided further opportunity to increase children's understanding of the width of techniques used in studying the past.

7.54 Pedagogic use: Multicultural influences

The final main learning focus came as the result of a convergence of three influences; a conversation with a year 6 teacher in a school geographically isolated from areas of cultural diversity in which he observed the challenge of conveying to the pupils the wider picture across the UK; reflections on the importance of understanding tenth century stone sculptures as products of a multi-cultural environment; and a chance encounter unrelated to this research[11], that recalled previous work on the complexity of contemporary multicultural art and the interest it can engender in primary-age pupils.

The corpus of surviving and hogbacks, even including the smaller fragments, is small. Yet the styles of decoration they utilise and the blend of religious, mythological and social meanings they appear to reflect is varied and markedly cross-cultural. Bringing out this complexity by building on knowledge the pupils have already started to develop in their encounter with the Gosforth Cross and linking it to contemporary artists whose work channels a number of diverse influences in a coherent, highly skilled and artistically and emotionally powerful way seemed a worthwhile approach. The link between first-millennium sculptures hewn from sandstone and contemporary work sculpted by Sumit Sarkar (CLEO, 2008) with a stylus on a graphic tablet, or meticulously wrought by the Singh Twins (Singh Twins, 2019) in Indian poster

[11] At a meeting of a group concerned with the plight of the Edgar's Field shrine to Minerva, Chester.

paint, gouache and gold leaf using ultra-fine brushes, may seem obscure. However, it can serve a useful purpose in providing a two-way metaphor that deepens understanding of the past and present.

7.61 *Great Clifton, Kirkby Stephen 01, Gosforth 05.*

These three sculptures stones were selected primarily because they share imagery with each other and offer the possibility of constructing a resource that develops learners' skills in recognising visual similarities and assessing their significance.

7.62 *Great Clifton*[12]

For anyone living outside Cumbria the villages of Great and Little Clifton are only marginally more accessible that Gosforth. As the early medieval stone sculpture in St Luke's has received little attention even in academic circles, it is unsurprising that it is seldom visited.

The stone, a 144 cm section of a cross shaft, emerged into written history in the same way as many of the pieces recorded in the Corpus of Anglo-Saxon Stone Sculpture, albeit rather late in the Victorian era of church restoration. In the summer of 1900 during the demolition of the walls of a dilapidated Chapelry, the stone was found acting as a lintel in a concealed doorway and first described the following year by Lidbetter (1901) and Collingwood (1901). The piece has been kept indoors since its discovery and appears to be in as good condition as when it reappeared over a century ago. When it was visited in 2017 to make a photogrammetric record in preparation for this research it was found to be propped upside-down against the south wall of the nave. It was turned to its proper orientation, but it was only possible to photograph the front side in sufficient detail for photogrammetry.

Figure 20: Two colours of sandstone on Great Clifton cross shaft.

There are five reasons why this is an important piece both from an academic and pedagogic perspective; the two figures fighting or riding on dragonesque

[12] Contrary to the CASSS entry, *Great Clifton* is in Little Clifton.

creatures are similar to the three carved on the 'Saint's Tomb' hogback, Gosforth 05; the bound figure at the foot of the shaft has similarities with Kirkby Stephen 01, there may be direct evidence of polychromy not observed prior to this research (figure nn); the use of material taken from the intersection of two distinctly coloured beds of sandstone (figure 20) is indirect evidence of polychromy (Bailey & Cramp,1988, p.110); polychromy (Bailey & Cramp, 1988, p.110); and the angle of the strata as viewed from the front[13] appears similar to Miller's observation the Gosforth Cross.

Figure 19. Evidence of polychrome on *Great Clifton* Cross shaft with dark patches, possibly gesso. Photograph from 3D model. R. Lang.

7.63 Kirkby Stephen 01

70 kilometres almost due east of Gosforth, Kirkby Stephen is on a medieval trade route running south from Carlisle down the Eden valley. It is the site of five pieces recorded in CASSS, one of which is described by Kopár (2012, p. 85) as 'the most impressive image of a bound figure'. Like Bailey (1980), she finds it impossible to make a precise identification of the figure due to what she describes as the 'mixed origin of this iconographical pattern'. Perhaps though, as argued above with the scene on the east side of the Gosforth Cross, the ambiguity of this bound figure, either Satan in chains in Rev. 20: 2, or Loki,

[13] Approximately 15°

less hygienically trussed up in his sons' intestines, may have been deliberate. For at least eight years, the Church has labelled the sculpture as 'The Loki Stone'.

7.64 Gosforth 05

Bailey (1996, p. 108) presents a strong summary of his argument for the 'Saint's Tomb' hogback to be the work of the artist who sculpted the surviving cross at the same site along with at least four of the other Gosforth stones. The obvious iconographic link with the 'Great Clifton' cross shaft 25 kilometres to the north is the presence of human figures straddling serpent/dragon figures. Unlike at Clifton the three figures have their legs weaving around the beast's body in what is referred to as an 'Anglian lock', though the Anglo-Saxon examples usually depict the legs of birds or quadrupeds' legs entwined in plant tendrils, for example *York Minster 01* and *York St Leonard's Place 02* (Lang, 1991, pp. 53-4 & 109-110). The dragon's jaws are longer and thinner on the Gosforth hogback than those on the Clifton stone.

8.1 Results of the school trials

The requirements of the Humanities Faculty ethics committee policy at the time of the start of the research meant that schools could only be approached by means of a formal letter explaining the research, and the procedure the school could follow in the event of any complaint arising from the conduct of the research. The researcher was required not to make any further attempt at communicating with the school in the event of receiving no response. Nine letters were sent out to schools; two in Lancashire and six in Cumbria. The schools were asked if they could host trials of three lessons; those about Halton and Gosforth, and a choice of one of the three other sessions. The schools waere given the option of the class teacher observing the lesson as taught by the researcher, or teaching the lesson themselves with the teacher observing. They were also asked to commit to discussing their observations of the lesson with the researcher.

Three responses were received to the letters, all of which agreed to the research. Consequently, the Ramsund/Halton and Gosforth lessons were taught three times each, the hogbacks lesson twice, the *provenance* session once, and elements from the ideas for *Great Clifton, Kirkby Stephen 01* and *Gosforth 05* were included in the Gosforth lesson in the third school.

8.21 School 1: first two lessons

The first school to reply to the letters of invitation only had sufficient available time for two afternoon sessions. For that reason the lessons about the Halton and Gosforth crosses were delivered without a break on the same afternoon. The two specially made short films of the 3d models had been uploaded to the school's network during the lunchtime. However, when the pupils tried to download the clips onto their laptops at the start of the lesson, the network was not able to provide sufficient bandwidth for them to be downloaded. As a result of persevering with the unsuccessful attempt there was a delay of over ten minutes before the lesson began. Fortunately, despite the hot and humid weather, the 31 year 5 pupils were impressively patient. The opening Google Earth screenshot-capture film of a virtual journey from the school to Ramsund in Sweden, the site of the Sigurd Rock carving used in the lesson got a positive response. The version of the lesson contained some early twentieth century black-and-white images of pipe-smoking, tweed-breeched archaeologists lying on the rock painting the chiselled lines to highlight the design, but these had to be explained and only slowed the pace of the lesson without adding anything and were cut from the lesson plan.

The class responded well to the task of co-operating in pairs on the creation of narratives for which the Ramsund Sigurd stone (Figure 22) could serve as an illustration. The children worked well devising the narrative with several examples of collaborative talk being overheard, for example children accepting and adding viable additional details to their partner's explanation of the reason for the 'snake' being stabbed by the sword-wielding, pointy-headed character with tiny legs.

When a few of the children's stories had been shared with the class by volunteers, the short version of the Fafnir episode from the Völsunga was narrated, after which the class were able to identify most of the episodes on the Ramsund stone with ease; the recognition of the smithy tools imagery required a little more prompting than had been anticipated.

The task of reading the story on the Halton cross, which was not possible for the children to work at individually or in pairs for the reasons mentioned above, had to be carried out by class discussion. The

classroom had a new interactive screen fitted which enabled the silent footage of the Halton Cross model (Lang, 2019e) to be seen clearly throughout the room. This way of working necessarily led to yet more teacher talk than had originally been planned. The film also had too many longueurs where the virtual camera remained motionless on the same view of the cross, further slowing the pace. Nonetheless, those children who volunteered answers correctly identified the episodes intended by each of the details that were layered with an opaque red cropped element from Collingwood's illustration.

When the full version of the Halton film, the class again appeared to watch attentively.

The same technological constraints applied to the Gosforth lesson that followed immediately on from the Halton one. The time given to the exercise of creating a storyline to explain the was reduced and the pupils were not asked to write down or draw their ideas. After the short version of the Death of Baldr and Ragnarök story had been narrated, the pupils again managed to identify elements of the story. They watched the Gosforth film (Lang, 2016b) attentively.

Teacher's Feedback

The lesson was discussed with the teacher on the following afternoon. He thought that the pupils had been really engaged;

> "I was impressed from the start how they were engaged and it was quite a warm afternoon. I think towards the end they started to tail — it didn't help with our server going down. I think if they'd had their own (silent video of the Halton Cross) to look through it would have helped." (Appendix 2)

He reported that the pupils had been talking about the lesson during the following registration and one had already been to see the Halton Cross with a parent on the same evening on the way back from Lancaster.

The teacher thought the lesson was pitched at the right level and that he would use the materials himself in future. He felt that the stories having such a strong local element 'really grasped them' When asked how he would adapt the lesson himself, he thought he would introduce a drama element, such as children acting a freeze-frame of a critical moment in one of the stories.

He thought that it would be helpful for teachers to have the story written alongside screen shots so that the teachers could see the relationship between the carvings and the elements of the stories.

As a result of these comments, the 'freeze-frame' idea was added as a suggestion to the lesson plans, and the pdf printable up to A3 size (Figure 21) was created.

8.22 School 1 lesson 3, 'Provenance'

The lesson was not successful. The start was delayed as the newly installed interactive screen had malfunctioned earlier in the day and could not be used. Another classroom was available but only after 12 minutes, and so the session started with a long, largely improvised introduction.

When the session began properly in the second room, the delivery was rather rushed and upon reflection, the instructions were not clear enough. They failed to make proper allowance for the need to break up exposition into small chunks as suggested by cognitive load theory. As it was, the pupils struggled to make progress, and though well-behaved, were not engaged with the work. After talking to less than half of the groups, it became clear that the lesson was not going to succeed in its original form and it was switched to an instructor-led, whole-class discussion.

In a short feedback session with the teacher, it was agreed that rather than being given all the elements of the evidence bank at the same time – a daunting sight for any reluctant readers — it would probably be better to break the work into separate sections, ensuring children understood one task at a time before eventually coming to an over-all conclusion. The teacher asked for copies of the resources and said he would like to use them himself next year.

Early on in the lesson the extent to which terrestrial television has diminished in importance to children had become evident. The 'Fake or Fortune' series, the healthy viewing figures for which were cited above, was only known to two of the pupils, only one of whom had watched a whole program. A two-minute trailer for an earlier series is on the BBC website (BBC, 2014). This could be shown at the start of the lesson with the children being told they are going to investigate two competing ideas about a strange and important 10th century stone sculpture. They will learn that they are going to be using 3D scans, evidence from archives and online resources to decide where they think it was made. The lesson could then be

structured in a way similar to the 'Fake or Fortune' format; the current view of the piece, a contrary opinion, investigation of a variety of types of evidence, a final show-down sequence with the generic jeopardy pause before the verdict is given.

At the time of writing it is no longer possible to try this idea out before the dissertation deadline, but trying a revised version out in another school will be a priority in the follow-up work. It would also be possible to film a pastiche of the BBC Trailer with children enacting the roles of the presenters and experts. The resulting film could form an addition to the online bank of resources.

8.31 School 2: Halton and Gosforth Lessons

The class at the second school was a mixed-age group with pupils in years three, four, five and six. To anyone who has not taught in such an environment this can seem a less than optimum arrangement, if not downright daunting. However, when organised well, there can be distinct advantages. As the class teacher and headteacher described in the feedback session, the older children can become more responsible, and helping their younger class members can also aid their own learning in a way referred below, in the teacher's feedback. The younger children also benefit from older role-models and can become more mature themselves.

The lesson on the Sigurd and Fafnir carvings at Ramsund and Halton was conducted during the second half of a morning.

The lesson began with the google-earth trip from the school to Ramsund in Sweden, a new way of creating the screen-grab movie had suggested itself since creating the first example, (Lang, 2019h) and future work will include a tutorial video published online for teachers wishing to try the method for their own schools. The exercise of creating a story for the Sigurd stone was carried out in mixed age groups. Because of the small size of the class it was possible to spend some time observing each group and the degree of cooperative talk was impressive. The groups read out their stories to the rest of the class, organising themselves so that an older child did the bulk of the reading, but made sure that all the other members of the group were involved in the presentation.

The class responded well to the story of Sigurd and Fafnir and had no difficulty in reading the Ramsund carving details. It was not possible to access the Sketchfab site on individual ipads as the firewall settings had not been changed (this was arranged by the time of the afternoon session) so the children were shown the silent movie edit of the Halton film on the electronic whiteboard, and most managed to identify the Sigurd elements, though the difference between the way details were portrayed in worn bas-relief on the Lancashire stone and what is essentially line drawing on the Ramsund rock face meant it required some prompting. The children were surprised at the full version of the Halton Cross film which begins with establishing shots of its location a quarter of a mile from the M6 motorway. Most of the children lived within a few miles of the site, yet none had realised there was a Viking-age sculpture so near.

After the lunchbreak, the lesson on the Gosforth Cross went well with the children being able to examine Dominic Powlesland's 3d model accessed on Sketchfab. The pupils were actively involved in class discussions and were able to make links between the similarities of Baldr's incomplete invulnerability and similar plot devices in Greek myth and modern super-hero stories. Only one child could recall the story of Samson and Delilah.

Feedback from the pupils was wholly positive and enthusiastic; they enjoyed the stories and were intrigued by the 3D models.

Staff feedback was provided by the headteacher and part-time KS2 class teacher. The school had been placed in the 'requires improvement' category in 2017 and the Headteacher and both the other two members of the teaching staff had joined the school during the present academic year. The interview happened later than intended because, shortly after the first lesson, the school was given notice of an Ofsted inspection, which resulted in the school being judged 'good'.

The teachers were enthusiastic about the lessons, their cross-curricular links to aspects of English and the way they covered aspects of the Viking age that the pupils had not previously encountered. They were also pleased with the way the mixed age groups worked together and the way 'being teachers in the classroom' helps the older children by "explaining things and guiding, so it brings in all the higher-order thinking skills of being able to assimilate the information and pass it on as well" (Appendix 3).

They were shown the crib-sheet made at the suggestion of the teacher in school one, and agreed it would be of help in follow-up work they would do to consolidate the learning.

They also suggested that in the absence of someone who knew the stories being present to tell them from memory, it would be helpful to have a video or audio file that could be used by a teacher instead of 'just reading the story off the sheet'.

They valued the way the lessons reinforced geography, with the Google Earth trip to Sweden, as well as strenthening the pupils' concept of chronology. The teachers, both new to the school had found the children's grasp of chronology to be very weak. The teachers had been discussing the possibility of the children making an audio-visual presentation that could be featured on the school's website.

There were no major changes made to the lesson plans following the second school sessions on Halton and Gosforth. The resource bank was increased to include silent versions of the one of the Gosforth films at the request of the staff for the children to script and voice their own narration (Lang, 2019). Their suggestion of the creation of an online performance of the story will be addressed after the current academic research phase, probably using children's illustrations from a London school and a voice-over narration.

8.32 School 2, Hogback Lesson.

A classroom assistant was present at the start to take the register and remained for a few minutes few of the lesson to arrange the class into mixed-age groups, but otherwise it was unobserved.

After a quick introduction about hogbacks and their creation around the same time as that of the Halton and Gosforth crosses, the class were shown a diagram of different breeds of dogs and there was a quick discussion of why it can be useful to classify life-forms and objects into different types. It did not appear that the children had yet studied classification.

They were then shown a method of classifying the different forms of hogbacks using a typology devised by James Lang as described above. They were then set the challenge of working in pairs to identify six

Sketchfab-hosted models of hogbacks that had already been loaded onto computers in the room next door.

The six models used for this first trial of the lesson differed in from the final version shown in Figure 39, in that they contained Powlesland's models of the two Gosforth hogbacks. The class enjoyed the prescribed exercise and the off-task ability to zoom inside the virtual hogback shells. They found the identification of the Heysham, West Kirby and Penrith hogbacks straightforward, but understandably had trouble with the Inchcolm and Gosforth sculptures as all three had aspects of more than one of typological class.

The second section of the lesson, about two competing theories concerning the creation of hogbacks, was not as successful. The different mixed-age grouping did not work as effectively and with the researcher being the only adult present it was difficult to answer questions about the resource materials and ensure the groups remained focussed. After a while the format was changed to a class discussion about the competing ideas and this worked as far as keeping the children engaged, but meant it was not possible to question the children individually to check on the level of their understanding.

At the end of the lesson we recapped what they had learned about the Vikings from the three sessions and how their attitude to the Vikings had changed, all but one of them saying that they now viewed them as more than just violent raiders. The exception was a pupil and had already formed a highly sophisticated understanding, being a member of a family that included an archaeologist and an historian who both had a strong interest in the early medieval period.

A report was made to the headteacher after the interview about the Halton and Gosforth sessions, and she asked for copies of the materials to enable some follow-up work.

Changes made for School 3 as a result of the Hogback lesson in School 2 .

The hogback typology challenge was changed to the format shown in Figure 16.27. The two Gosforth hogbacks that had caused understandable confusion were dropped from the task and one was replaced by a well-executed structure-from-motion model of one the Govan pieces (Liu Su, 2018). An extra photogrammetric scan was made to replace the other Gosforth hogback. The Brompton pieces being arguably the most important examples, probably some of the earliest, and the most technically

accomplished, it was decided to attempt a scan of one of the three complete stones in Brompton Church. The positioning of the stones makes photogrammetry highly problematic as they are arranged in parallel only a short distance apart. Brompton 17, the best preserved, but is placed in the middle of the group, making it impossible to get even a micro-four thirds camera close enough to the lower half of either of the long sides without resorting to the use of an ultra-wide-angle lens. Brompton 20 is even less accessibly being between Brompton 17 and the church wall, leaving Brompton 19 as the only viable option. The resulting model (Lang, 2019c) is imperfect, particularly on the lower C side, but fortunately the area involved is also a section of the actual stone that has been damaged and the quality is good enough for the use for which it is intended.

In view of the difficulty in explaining the nature of the sandstone rock used in Gosforth and Amy Miller's observations about its alignment, it was decided to create a short film mixing animation and real world footage (Lang, 2019d). It is described above on pages 42-43.

8.41 School Three, Halton Lesson and Gosforth Lesson with 'Loki Stone' element and film about the carving of the Gosforth Cross.

The class in school three consisted of 23 year 6 pupils. The response to the Ramsund / Halton lesson was quiet but engaged and most of the pupils were able to identify the elements of the Sigurd narrative shown on the Halton Cross.

The core element of the Gosforth lesson, the Death of Baldr story and Ragnarök and its representation on the cross went successfully, and revealed no further amendments being necessary to the plan. The film made to explain Miller's theory seemed effective and a quick question and answer session revealed that the majority of the class seemed to grasp the idea, even though in the space of less than two minutes it covers several concepts that would have been new to them. A teacher who knew the class would have been able to follow up the film with more focussed questions to ensure that the children likely to have struggled with the concepts had actually understood them.

The children were interested in the 'Loki Stone', Gosforth hogback and Little Clifton cross-shaft and were able to spot the nexus of similarities between them using the 3D models on laptops and one of them volunteered, without being asked, the link between the angle of the intersection of the differently coloured layers on the Little Clifton stone and the film about Miller's idea.

This was a particularly encouraging result, as it represents probably the most technically complex use of 3D models of any exercise in the resources. From the observation, it seemed that the children were navigating the 3D models with the laptop touchpad more easily than anticipated, though it may be that the groups had delegated the most confident member with the task.

8.42 School 3, Hogback lesson Revised version with Multicultural element

In a conversation during the lunchtime of the first day at the school, the class teacher mentioned the challenge of raising his pupils' awareness of the multicultural nature of the UK, due to the geographical isolation of the school. Making a link with that and previous thoughts about ways of explaining the complex multicultural nature of 10th century Britain, a new introduction was created for the lesson. As both the Gosforth Cross and the variety of forms of hogback stones reveal a wide range of influences in their design, it was decided to look at some contemporary British artists and the ways in which their work reflected a variety of influences, both on their subject matter and techniques.

A powerpoint presentation started by looking work by the London-born Sumit Sarkar, who in 2008-9 worked on an Arts Council funded project creating manga and Transporters-style virtual sculptures of Hindu Deities using Dutch open-source software, a graphic tablet and an Amercian-designed computer built in China.

The next slides showed work by the Singh Twins— Rabindra and Amrit Kaur-Singh. Their meticulous Indian poster-paint and gouache paintings often embellished with gold-leaf are obviously influenced by the Persian/Indian miniature tradition, but also by a wider hinterland of world politics, their Sikh heritage, popular western culture and even 18th century British cartoons.

Having previously, in a different context, seen children's reaction to the work of the Singh Twins and Sumit Sarkar, the positive response to the images was unsurprising. They were also able to see the link with the

following section which looked at features on the Gosforth Cross that showed the sculptor's influence from the north of Scandinavia (Borre pattern), Ireland (the *triquetra* and metalwork crucifixion plaques) and Anglo-Saxon high crosses as well as the Norse and Christian mythological elements.

The feedback from the teacher was that the lesson worked best for the middle and higher ability children but that for the less-able ones, some of the concepts would need to be broken down further (Appendix 3). The teacher was confident of being able to teach the lessons in the future.

8.5 Summary of the Results of the Trial Lessons.

The lessons became increasingly effective over the phase. This was due to a combination of several factors. It proved important to ensure that the firewall clearance for Sketchfab and Vimeo extended to the pupils as well as teachers, and that where possible materials were downloaded before the lessons. Revisions and additions were made to the resources in light of suggestions from teaching staff and comments from pupils and from the researcher's own reflections on the pedagogy.

Even the one unsuccessful lesson trial, that focussing on the *Penrith 11* limestone plaque, offered enough encouraging features to lead to the conclusion that a teacher already aware of the pupils' ability range and having better fortune with the technology would be able to deliver an effective lesson.

9 Revised Lesson Plans and Resources

These lessons plans are presented in the format that they will be published for teachers except for three categories of changes. Some of the images are reduced in size as they are intended to be released in A4 landscape format. APA format citations have been added. Certain images have been replaced by urls: classroom teachers have an exemption to use some copyright materials that does not extend to producers of free downloadable materials for classroom use, nor to writers of a university thesis that may become available online (Copyrightuser, 2019).

Several of the Information sheets and slides of a powerpoint presentation have been placed in appendices the as their content is largely covered elsewhere in the thesis

9.1 The Halton Cross

This lesson and the following one have been found to work best if they are taught on the same day, either side of a lunch break. They can take between 1 hour and 90 minutes each.

Aims: Pupils will gain an insight into Viking culture through studying one of the most important Norse myths and one of the saga episodes most commonly represented on early medieval stone sculpture;

They will learn to 'read' non-written primary sources and relate them to simplified translations of the Norse narratives;

Pupils will learn that the peoples we call 'Vikings' did not all conform to a single cultural stereotype and that the 10th-century settlers in the North West are very likely to have arrived already having at least had contact with Christianity;

Pupils will gain an insight into the way religions can assimilate existing beliefs as they spread to new areas.

9.21 Preparing for the lesson

You will need to liaise with whoever controls the firewall for your school's internet access, to ensure that the Sketchfab.com and Vimeo.com websites are accessible for the lesson. 'Sketchfab' is used by many of the world's leading museums to share online 3D models of exhibits, but many firewalls used by schools block the site.

An optional opening of the lesson is to make a Google Earth flight journey from your school to the site of the Ramsund stone in Sweden. A short film explaining how this can be done is at www.vimeo.com/rwlang/ft (Lang, 2019**N**). An example of such a flight journey, pausing in mid-flight to show the British Isles and the Viking homelands, is at www.vimeo.com/rwlang/cps2r (Lang, 2019h).

At the suggestion of a member of staff during the trial lessons, a guide for teachers to the two carvings featured in this lesson is included in the downloadable materials (Figure 21).

9.22 Arrange the class in groups of two and give out the A4 sheets of the Ramsund Sigurd Rock Carving (Figure 22).

Figure 22: Drawing of Sigurd Rock Carving, Ramsund, Sweden, Oscar Montelius, 1877. Public Domain. (Montelius, O., 1877).

Task them to devise the outline of a story that would explain what is happening in the picture. They can map their idea as a storyboard or bullet point summary. Explain that the same character might occur in more than one place in the image and that the image is a combination of incidents from different pasts of a storyline. Should they ask what the rune writing says, explain that it is of no help to understanding the story - it just says that a nearby bridge was built to celebrate a dead Viking (it translates as *'Sigridr, Alrikr's mother, Ormr's daughter made this bridge for the soul of Holmgirr, father of Sigrodr, her husband'*).

You may wish to ask them if they can identify the objects immediately to the right of the decapitated figure at the bottom left hand corner (hammer, bellows, anvil, fire and tongs).

9.23 After around thirty minutes, ask the groups to finish work even if it is still in progress. Explain that you want the pupils to listen to each other's storylines and will be asking them to say what they thought were the two strongest similarities and one biggest difference between their story and those of other groups.

9.24 After they have shared their ideas explain that the story illustrated on the rock was written down in Iceland, two hundred years after the carving was made. Either read or tell the simplified version of the story of Sigurd and Fafnir to the pupils (Culture Street, 2016 a).[14]

9.25 Ask if the pupils to look again at the Ramsund carving sheet and check that they can now 'read' its meaning.

9.26 Ask if they think there are any Viking age carvings of Sigurd outside Sweden, Norway, Denmark or Iceland? Explain that there are several in the British Isles, the most complete of which is in a suburb of Lancaster.

9.27 Show the Sketchfab Halton Cross model https://skfb.ly/6IJv8 (Lang, 2017c) on the whiteboard to the whole group. Then let then access on individual desktop, laptop or tablet, ***either*** the sketchfab model, ***or*** the edited silent footage of the Halton Cross film https://vimeo.com/rwlang/hc Discuss what they have been able to recognise.

9.28 Play them the Halton Cross Film – full version https://www.vimeo.com/rwlang/haltoncross (Lang, 2017d).

9.29 Discuss any plot similarities the pupils can think of between the Sigurd tale and J.R.R.Tolkien's fiction (dwarves, dragon, treasure, special ring, special sword, talking birds, super-horse, shape-changers). Explain that Tolkien's day-job was as an Oxford Professor studying north-European medieval literature such as the sagas.

[14] A online film version narrated and illustrated by primary school children, that can be used at this point, is proposed as a follow-up to this research.

Ask why they think the same sort of fantasy stories that entertained the Vikings are still popular today. Tell them that next lesson they will be studying a much more complicated and impressive carving on the finest Viking Age sculpture in England.

9.2 The Gosforth Cross

9.21 Arrange the class in groups of two and give out the A4 sheets of Parker's drawing of the Gosforth Cross (Figure 23) and let them access Professor Dominic Powlesland's scan on a laptop, tablet or desktop https://skfb.ly/6JqLG (Powlesland, 2016)[15].

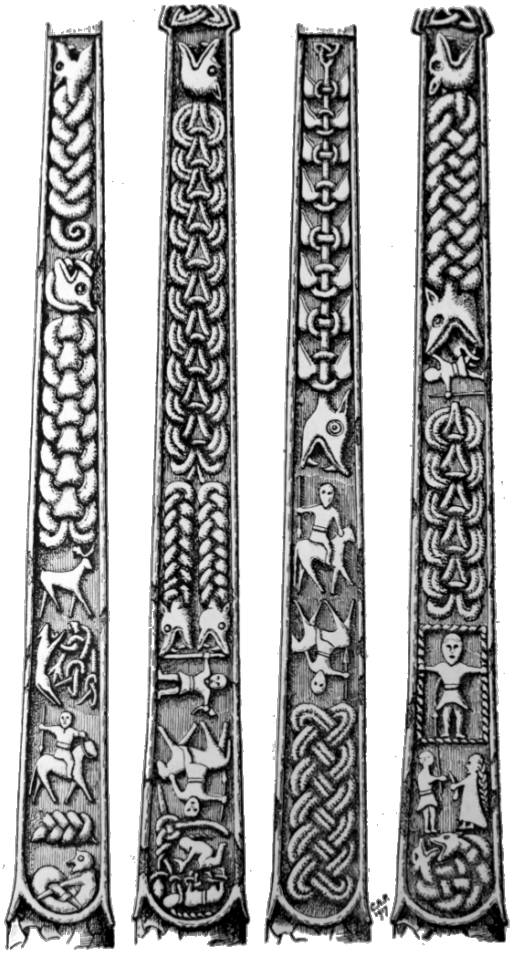


Figure 23: The Gosforth Cross – drawing by C.A. Parker (Parker & Collingwood, 1917, p. 101).

Explain that they are repeating the same exercise as in the previous lesson, but this time with a more detailed saga with different elements of the story spread all over the upper section of an 1100-year-old 4.2 metre-high cross.

You could tell them that Loki reappears in this tale and that again it is his wrong-doing that starts the story off. After around thirty minutes, groups report back and hear each other's storylines as in the previous session

10.22 Either tell or read them the version of the Death of Baldr & Ragnarök story (Culture Street, 2016b). Hand out the Ragnarök sheets and ask them to identify incidents on the cross that seem to illustrate the story.

[15] The 3D scan of the Gosforth Cross made by Professor Dominic Powlesland with financial support from the Leverhulme Trust 'Impact of Diasporas' research programme at the University of Leicester.

9.23 Explain that there may be something else that may be 'read' on the cross and hand out the sheet summarising key events from the book of revelation and Christian tradition and see how many they can match with details on the cross .

9.24 Play the Richard Cobden Primary version of the Gosforth Cross film followed by the Gosforth Primary one, asking them which information was added to the second film.

Check they understand the explanation offered for why Vikings and Saxons appear to have lived relatively peacefully in this part of England.

9.25 Finish by explaining that new theories about the Gosforth Cross are being developed even in this decade. Play them the film 'Gosforth Cross: *New Angles*' https://vimeo.com/rwlang/gcna (Lang, 2019d).

9.3 Lesson Plan: Hogback Stones

These lesson notes assume that the pupils will have already been taught the Halton Cross and Gosforth Cross lessons.

This lesson can be taught in two sessions. With sufficient discussion, sections 10.31 – 10.36 will probably take around 30 minutes. 9.47 – 9.49 is more challenging: allow an hour at least.

Aims: To raise pupils' understanding of the use of typology as a tool for understanding the past.

To give the pupils the chance to see the difficulties involved in creating and applying a typology.

To develop children's understanding of how contrasting theories about the past can be constructed from the same evidence.

To raise awareness of how a multicultural society can influence art and craft in the tenth and twenty-first centuries.

Prior to the lesson.

As with the Halton Cross and Gosforth Cross lessons, an exception to the school's firewall may need to be made for the 'Sketchfab.com' website. ('Sketchfab' is used by many of the world's

leading museums to share online 3D models of exhibits, but many firewalls used by schools block the site.)

With the help of a classroom assistant or volunteer pupil, set up laptops into six groups. All laptops in each group should show one of the models at the URLs given on the 'Six Hogbacks' worksheet. Once the Sketchfab page has loaded, click the icon in the lower right corner of the model window to set it to whole screen view. If there are 18 laptops you should get a set up something like this for your first set, all showing the Heysham hogback.

Figure 24. Laptop arrangement example.

Put a piece of paper or card by each laptop with the number of the hogback it is displaying. Close the laptops; they should open on the right screen when needed later.

9.31 Show the Multicultural Art PowerPoint in 'Presenter View' and read or paraphrase the notes on the bottom left of slide. [The powerpoint will be available as a downloadable resource from the same source as the lesson plans.] Appendix 9

9.32 The pupils will probably already have studied the concepts of grouping and classification in science, for example with reference to rocks in year 3. Briefly discuss with them why science uses grouping. Explain that grouping is also used in the study of the past, particularly by archaeologists, and that they are going to start learning about a strange and mysterious type of stone sculpture that developed in this country 1100 years ago by using an archaeologist's 'typology' of hogback stones.

9.33 Hand out the A4 landscape format ‘Types of Hogback’ sheet (Figure 16.06), and briefly talk through the example drawings. The word ‘niche’ will almost certainly need explaining. Ask them to look at types C and D, and see which feature is wider in D than C and they should be able to figure out what niche means. ‘Pilaster’ means a sort of dummy pillar, a thin rectangle in cross-section, that is joined onto a wall. (Figure 24). There may be banks or church buildings near your school that have examples of such features you could give as examples.

9.34 Hand out the Hogback survey sheet (Figure 40).

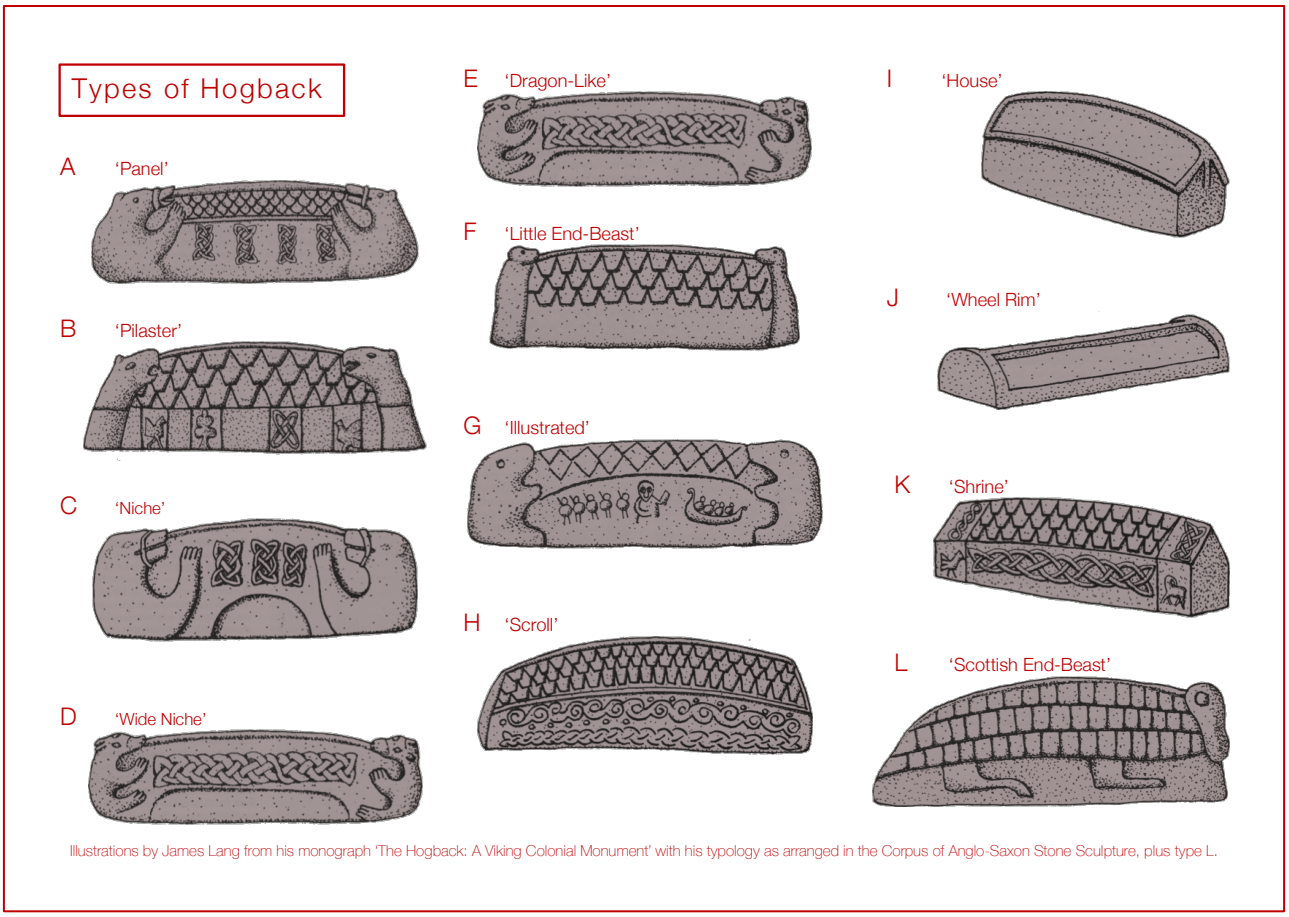
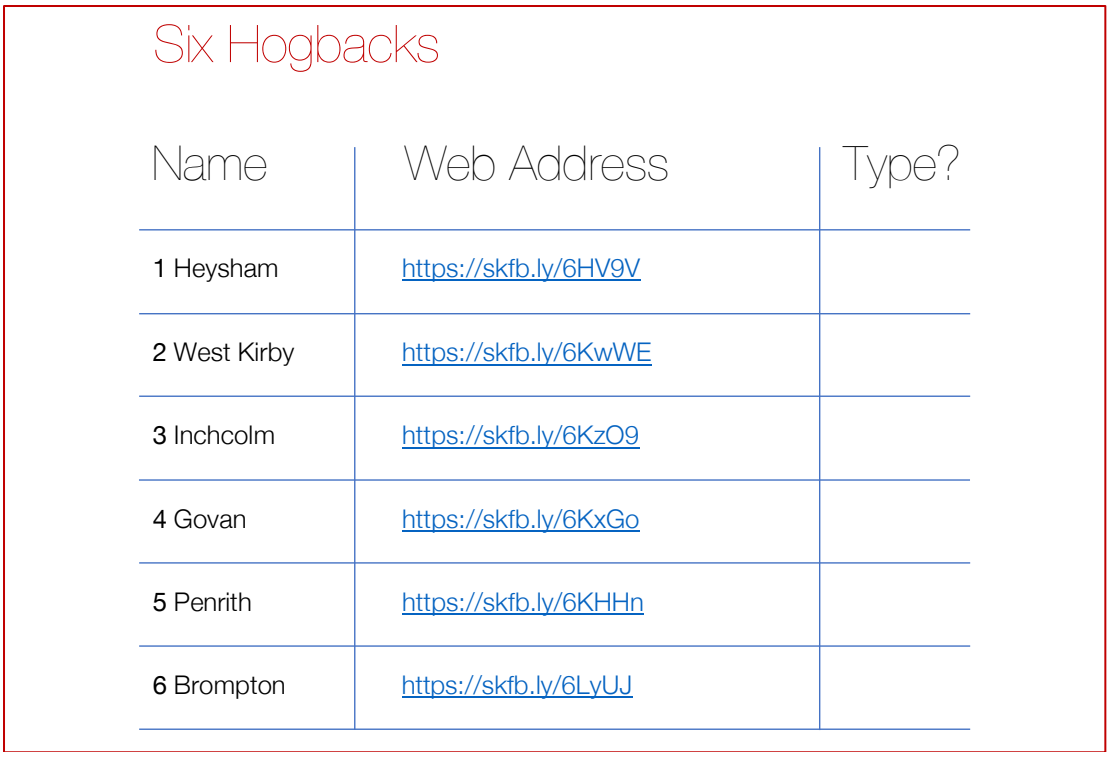


Figure 39: Types of Hogback. From Lang (1984). by kind permission of the Institute of Archaeology, University of Oxford.

9.35 Task the children to work in pairs moving round the laptops, identifying the type of each of the six hogbacks, and writing their answers on the sheets. Suggest that they revolve the models around to view all sides. (This is easier with a separate computer mouse than on a built-in touchpad – either way it could prove difficult for dyspraxic children.)



Six Hogbacks

Name	Web Address	Type?
1 Heysham	https://skfb.ly/6HV9V	
2 West Kirby	https://skfb.ly/6KwWE	
3 Inchcolm	https://skfb.ly/6KzO9	
4 Govan	https://skfb.ly/6KxGo	
5 Penrith	https://skfb.ly/6KHHn	
6 Brompton	https://skfb.ly/6LyUJ	

Figure 40: Hogback survey sheet.

9.36 When the groups are nearly all finished, see what level of agreement there is between them. Some of the six could be argued to belong to more than one type, the most extreme example being the Inchcolm hogback. This has two end-beasts, one of which is very like the 'little end-beast type'. However there are also some figures in the centre of the side on which the Sketchfab model opens that could be related as part of a scene. One of the figures is similar to those with arms held up on the sides of the Heysham Hogback; a 'G' (illustrated) type. James Lang's own verdict was that this stone is an example of the 'B' (pilaster) type and if the model is turned around, it becomes easier to see why he considered it so. The accepted classification for the six is; Heysham – type G; West Kirby – type H; Govan - type L; Inchcolm - type B; Penrith – type H; Brompton – type A.

9.37 Show the distribution map of hogbacks (Figure 41) on the electronic whiteboard. Explain; the larger purple dots are where more than one hogback has been found in the same place; these are the only hogbacks discovered anywhere: there were none in Scandinavia or Iceland for example. Ask them

to name the area of the U.K. where hogbacks were most common. Does that necessarily mean hogbacks were first made there?

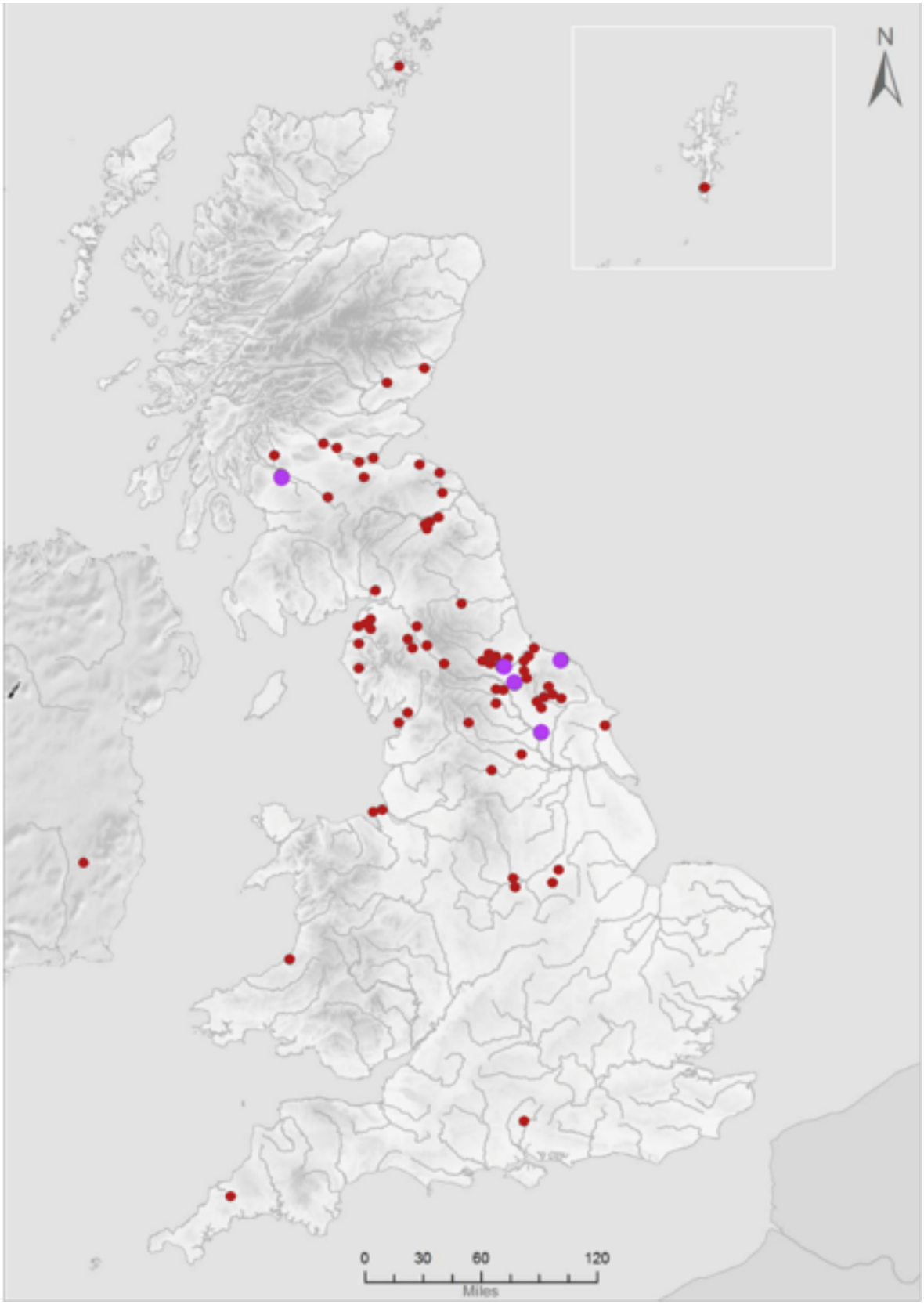


Figure 41: Distribution of Hogbacks; slightly adapted. By kind permission from Williams (2015).

9.38 Show the map with the added layer of those place names containing an element from the language the Vikings spoke.

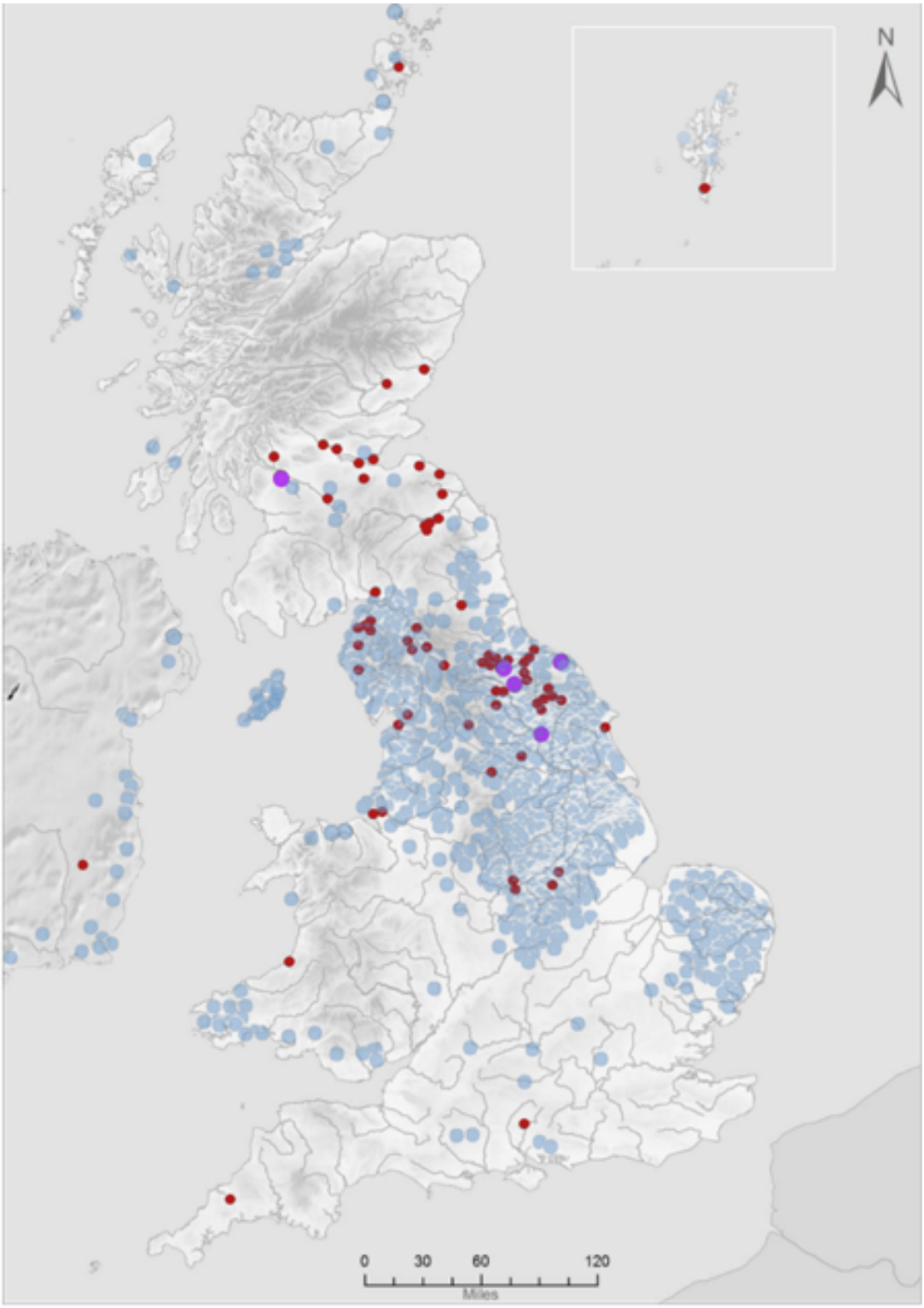


Figure 42: Distribution of Hogbacks, adapted from Williams (2015), plus place-name data – blue dots — from data from British Museum (2004).

If your school is anywhere near the blue dots, there should be a fairly local example you can quote. Common Old Norse place name elements include;

beck, by, firth, force, foss, garth,

gate, ghyll, gill, howe, keld, kirk,

ness, rigg, ster, thwaite, toft, and wick.

Ask the class to discuss in small groups what is the strongest evidence from the map for and against hogbacks being objects developed by Viking settlers. Hear a quick report back from each group and discuss any different arguments.

9.391 Explain that different archaeologists and historians can have different ideas about why objects were made and who made them. The class are going to work in groups.

Each group needs to;

- read two different theories and one sheet of extra information about hogbacks,
- see if they can agree on which theory they prefer – or if there is some way to combine parts of the theories with some of the extra information,
- prepare a short presentation to argue for their preferred view.

Hand out the sheets. Appendix 7 You may want to talk thorough each sheet with them and the information will need to be broken down.

Hear the groups' presentations and see if a class debate can reach a consensus opinion.

9.392 The group take forty minutes to agree and script the bullet points for a presentation that will give their opinion based on the information they have read. They may choose to side completely with one explanation, or create their own composite from two or more opinions, or decide there is no way of really knowing.

9.393 Members from each group give their presentations.

9.394 The class discusses the main similarities and differences between the groups' \ presentations.

9.4 Lesson Plan: Dragon Riders and Bound Devils?

Aims: Learners will practice analysis of three online 3D models of early medieval stone sculpture.

They will formulate and explain a theory about the creation of the stones and about why the Little Clifton sculptor used such an unusual piece of rock.

This supports the 'Aims' requirement of ENC 2014 History;

> 'understand the methods of historical enquiry, including how evidence is used rigorously to make historical claims, and discern how and why contrasting arguments and interpretations of the past have been constructed'.

Suggested Classroom Activity:

Preparation for the lesson. The school's internet firewall will need to permit access to the Sketchfab website. The pupils will need access via laptop or desktop of either the online 3D models, or silent film spins of;

- the 'Loki Stone' cross shaft fragment , Kirkby Stephen; https://skfb.ly/6IsQ6 (3D model) https://vimeo.com/rwlang/ks film
- the 'Saint's Shrine' Hogback, Gosforth, https://skfb.ly/6JnJW 3D model https://vimeo.com/325854514/81e381fc53 film
- the cross-shaft fragment at Saint Luke's, Little Clifton, https://skfb.ly/6HVuq 3D model https://vimeo.com/rwlang/c film

A recommended method is outlined at the start of the Hogbacks lesson resource.

9.41 Task them to work in pairs, or small groups, for ten minutes to see if they can identify the most important similarities between the images on the carvings.

Figure 35: (left) Cross Shaft fragment, St Luke's, Little Clifton (*Great Clifton*) with human figures on serpents coloured red. Edited photograph from 3D model, R. Lang.

Figure 36: (centre) Powelsland's 3D model of 'Saint's Tomb' hogback, Gosforth (*Gosforth 05*), human figures on serpents coloured red. Edited photograph, R. Lang.

Figure 37: (top right) Cross Shaft fragment at Little Clifton (*Great Clifton*) with figure at the base coloured red. Edited photograph, R. Lang.

Figure 38: (bottom right) Cross Shaft fragment — the 'Loki Stone — at Kirby Stephen. Photograph of 3D model, R.Lang.

They should be able to identify;

- the human figures on the Gosforth and Little Clifton stones that seem to be riding on, or fighting with, serpents or dragons.
- the standing figures at the foot of the Little Clifton cross shaft and dominating the Kirkby Stephen fragment.

The pupils report back their findings.

9.42 Ask them two work again in pairs for five minutes and see if they can decide which of the two pieces look most likely to have been made by the same sculptor. Ask them to agree on reasons for their opinion.

[There is no 'right answer', though the styles of the Little Clifton and Gosforth pieces look closer – the important thing is for the pupils to find reasons for their verdict.]

9.43 A quick discussion about anything unusual they noticed about the stone used in one of the carvings?

They should have spotted the two distinct colours of stone that make up the Little Clifton cross shaft fragment (Figure 35).

Ask what the different colour of the stones might tell us about the way they would have looked when they were first shown. This is a difficult question and a lot of prompting may be required. Most early medieval sculpture would have been painted, so the colour of the stone would not have been visible.

9.44 Show the two minute long 'Gosforth Cross: *New Angles'* film https://vimeo.com/rwlang/gcna (Lang, 2019d). Ask them if they see anything in the film that reminds them of one of the three sculptures they have looked at in the lesson. They may notice that from the front, the angle between the two colours of sandstone on the Little Clifton piece looks similar to the one Amy Miller observed on the Gosforth Cross.

9.5 Limestone Crucifixion Plaque

Aims:

Learners will practice analysis of texts and images to evaluate two theories about the origin of an early medieval sculpture, and to decide if it is possible to tell which of three similar scenes was created first.

This supports the 'Aims' requirement of ENC 2014 History 'understand the methods of historical enquiry, including how evidence is used rigorously to make historical claims, and discern how and why contrasting arguments and interpretations of the past have been constructed'.

9.51 Suggested Classroom Activity

Begin with discussing the BBC "Fake or Fortune' series. With up to 5 million viewers a week, it has for seven years had the highest UK viewing figures of any arts-themed programme. Have they, or anyone in their family, watched it?

Play the BBC trailer for an earlier series https://www.bbc.co.uk/programmes/p01nmnd6 .

9.52 Using the whiteboard Show the Sketchfab scan of the Limestone Crucifixion Plaque in Kendal Museum(https://skfb.ly/6IGy9). Explain that it is probably about 1100 years old, but that there is a disagreement about where it came from. They are going to investigate the evidence. Say that it wasn't possible to scan the back of the piece.

9.53 Ask the learners to work in pairs looking at the piece on tablet, laptop, or desktop using the Sketchfab model https://skfb.ly/6IGy9 (Lang, 2018), or the silent film spin https://vimeo.com/rwlang/lcp (Lang, 2019g), and decide what they think it shows and if they notice anything unusual about it.

9.54 Ask if they noticed anything about the piece that they would not expect to find on an 1100-year-old stone sculpture. Hopefully if they are using the Sketchfab scan someone will have spotted the evidence of paint (the black is probably a 'gesso' — a sort of plaster undercoat). The film spin takes the viewer to close-ups, so children using that should have no problem.
Explain that most stone sculpture during the Anglo-Saxon period would have been painted. Ask what the remains of paint might mean about where the piece has been for most of the past 1100 years (probably somewhere indoors!).

9.55 Explain that there is a huge catalogue the stone sculptures made in England from the 7th to 11th centuries A.D. (The Corpus of Anglo-Saxon Stone Sculpture). It has being written by leading experts and was launched in 1977 and won't be finished till 2022!

9.56 Show the 'Penrith 11' entry from the dropdown menu in the online edition of CASSS volume 2 http://www.ascorpus.ac.uk/catvol2.php?pageNum_urls=140&totalRows_urls=181 ***The url opens on 'Penrith 01' — you will need to click through to Penrith 11 using the large red arrow on the right hand side of the webpage.***
Ask them if they can spot what type of stone the entry says the plaque is carved from. (Limestone).

Click back through the previous 10 entries and ask them what stone each is made from (a pattern quickly emerges! – they are all sandstone).

9.57 Arrange the class in small groups. Explain they are going to be given evidence, some of which was not available to the experts at the time they wrote their description (it was published in 1988).

Each group given two copies the following: **Appendix 10**

o Map of Lowther, Askham and Penrith with bedrock info. (Figure 39)
o Extract from Richard Bailey on the use of local stones for carving. Askham Church Information (Figure 40)
o Transcription from the 1875 Lowther Castle inventory. (Figure 41) (the important info is on the bottom line)
o Extract from the Corpus with version in simpler English. Front cover of the 1947 Maples & Co. Catalogue. (Figure 42)

Give them thirty-five minutes to form an alternative idea of where 'Penrith 11' might have come from. They should also decide whether or not their new idea is more convincing.

9.57 Groups report back and share their ideas. Either as a straight presentation, or you could ask them to prepare a performance in the style of the generic final scene of a *Fake or Fortune* episode.

9.58 Additional exercise.

'Penrith 11', wherever it was made, is very similar to some Irish metalwork pieces, particularly the Clonmacnoise Crucifixion Plaque. It also has something in common with a section on the east side of the Gosforth Cross.

Show the scan on the whiteboard again (https://skfb.ly/6IGy9).

Ask them if they know what exactly is happening in the scene. If they have already seen the Gosforth Cross film, they may remember 'Longinus' the name given by the early church to the soldier who stabs the side of Christ.

9.591 Give the groups copies of the extract from John's gospel. (Or show it on the whiteboard.) See if they can now 'read' the limestone plaque.

9.592 Give out copies of the crucifixion fresco from St Mary Antiqua, Rome (Figure 14), or show it on the whiteboard. This is now thought to be the oldest painting of the crucifixion depicting Christ being offered the wine vinegar and being stabbed in the side. Ask what is the main difference between the Clonmacnoise & '*Penrith 11'* pieces and the other images like St Mary Antiqua. (Longinus and Stephaton are almost always shown on the left and right sides, respectively – so that Longinus is stabbing Christ's right side.)

10.1 Summary of the Results of the Research

Phase one of the research established some circumstantial evidence that the wording of the final version of the statutory requirements of the ENC with regard to the Viking role in English history, particularly the removal of the mention of cooperation between Anglo-Saxons and Vikings, points to a degree of political purpose. This is further supported by the late inclusion of Danegeld in the suggested content. The use of Danegeld as an illustrative device in history books written for children was traced back to Dickens and Kipling and the influence of the latter revealed in an online search of Hansard.

A survey of 215 Cumbrian school websites revealed that just over half mentioned the Vikings in the account of their school's curriculum and explained why the number of very small schools might have influenced this figure in a negative way. It found that only 22% of the schools referenced the skills their history curriculum aimed to foster. Evidence was found that 13% of the schools were teaching in a way that fostered a wider view of the Viking diaspora than that presented by the ENC.

The complete lack of any reference to local study of early medieval stone sculptures was disappointing, but adds further justification to this research.

The results of the review of free online learning materials covering the Viking period was more encouraging than the more cursory study made for the RSA Fellowship project. The TES resources most highly-rated by teachers contained some higher order thinking activities, were factually error-free and presented a more balanced view of the insular Viking diaspora than the wording of the ENC.

The review of freely-available online 3D models revealed a growing number of useful pieces. The review of academic work on the stone sculptures selected for the project was particularly fruitful in stimulating ideas for lesson resources.

The search for a methodology that would be applicable to the school trials identified Lesson Study as the nearest fit for the timescale, geographical scale, and limited sample size of the research. The quality of the teachers' contributions in the formal feedback settings, their observations of the pupils' learning, and in informal talk in the staffroom was excellent, and the lesson plans and resources were significantly improved by their involvement.

The lesson trials delivered encouraging results. The schools all had robust broadband connectivity, though there were issues with the network connectivity in one site. Laptops and desktops proved the best platforms for accessing the 3D models, but more recent tablets were also sufficient. No school had tablets capable of delivering AR versions of the 3D models, and none had virtual reality headsets.

The overall quality of learning was judged to be good, though there is more work to be done on making the initial delivery of information accessible to all pupils in mixed-ability classes, particularly for the lessons on *Penrith 11* and for the second half of the lesson on hogbacks.

In short, the core research question: 'Can photogrammetry and film be used to create online learning materials that enrich the early medieval content of the History component in the English National Curriculum 2014?' was answered in the affirmative.

10.2 Limitations of the research

The procedural requirements of the Faculty Ethics Committee at the time the research was made stipulated that schools could only be approached by means of a letter following a format outlining the intentions of the research and detailing the commitment the school would be entering into and the procedure they should follow should they have any complaints about the research. The researcher was not allowed to contact any schools that do not reply. Given the time pressure primary school head teachers work under, many having an additional classroom teaching commitment, and given the strong anecdotal evidence that printed communications are often opened by secretarial staff anxious to avoid passing on unnecessary work to the addressee, a response rate of 33% should not be seen as a reflection of a lack of interest in this type of research.

Even had all nine schools accepted the invitation to take part, the research would still be unable to claim statistical value, but the observation-based cyclical methodology of a Lesson Study-type approach was found to work effectively.

11 Discussion

This discussion examines ways in which communicating scholarly theory to primary age children can reveal some new perspectives on academic thinking, and conversely, how even the more abstruse and technical academic theories can stimulate viable ideas for classroom practice.

One of the remarkable observations first made during the RSA Fellowship project and confirmed in present research was that ten-year-old children can hear a retelling of a story written down in 13th-century Iceland and remember it well enough to decipher marks made on stones in the 10th-century English north-west.

There are two striking aspects to that observation. The first is the way that the sculptor's visual language requires no translation for third-millennium children. The slapstick violence of a decapitated blacksmith, the comedy value of Sigurd sucking his thumb after using it to taste meat straight from the flames, communicate just as directly as incidents from a modern cartoon. As yet, no academic literature that refers to the original audience for early medieval sculpture seems to have fully considered that it would

have included children, and that they would have understood and enjoyed the carvings as much as young people today, and even more so when the stone was brightly coloured. Even if, as time passed, the stories became less frequently told, children's curiosity would lead them to ask the meanings of the images and some version of the myth or saga would filter down the generations perhaps increasingly diluted until like the final layer of paint on the cross, it faded away.

The second noteworthy aspect is the correlation, close enough for ten-year-olds to spot, between the marks of the 10th century Cumbrian chisel and those of the 13th century Icelandic quill. References to Sturluson's records of Norse mythology frequently carry a warning that they represent a Christian redaction of pre-Christian material. There are certainly elements of the Prose Edda that display such tendencies. However, the direct correspondence between scenes on the Gosforth Cross and Sturluson's account in the *Gylfaginning* (Figures 8 & 9) deserves to be treated as important data. It presents problems for the hypothesis that Víðarr's similarity to the medieval view of a warrior-Christ is merely the product of some 13th century Christian spin-Doctor of Divinity.

The core resources focussed on the story elements of the stone sculptures primarily because they are so engaging to children. One result of concentrating on the Norse mythological and saga material was to create an impression that it was undervalued in more recent trends in academic thinking. There is tendency to caution against the use of the word 'Viking' for 10th century Scandinavian settlers and the artefacts they produced. Instead, though emphasise is rightly put on the rich multicultural mix that was occurring in late first millennium Britain, this is sometimes at the expense of acknowledging the active Viking diaspora network operating into the following millennium, as argued by Jesch (2015), Vohra (forthcoming) and others. A chronological spectrum stretches from the eighth-century Danish first-footers, to the final disappearance in England of Old Norse, the last surviving example of which is a runic inscription on a mid-12th century tympanum in Pennington, Cumbria (Lang, 2017e). Any certainty about the point along that timeline when those of Scandinavian descent stopped self-identifying as such seems misplaced. Townend finds the Pennington inscription to represent a 'perfectly acceptable form' of Old Norse, if with lessened inflections (Townend, 2002). He also stresses that this post-Conquest use of the

language is found on the arch that would have been in a prominent position above a church doorway, which strongly suggests that its commissioner had significant social status. He could have added that Pennington was not an isolated community in which an archaic language might have survived through lack of contact with the outside world, but a settlement only four kilometres from Morecambe Bay – an area long associated with the Irish Sea trade networks. It was also a locality with a long-established Anglo-Saxon presence, witnessed by an Old English rune inscription two kilometres away - *Urswick 01* (Bailey and Cramp, 1988).

The second effect mentioned in the opening of this section — academic writing sparking ideas for primary school lessons — is found in most of the lesson resources. To take two examples; the topology exercise which made for one of the best pedagogical uses of 3D scans in the research, came from a 1984 monograph in a volume published by the then Oxford University Committee for Archaeology and unlikely to be found on any staffroom bookshelf. Despite the specialised nature of the subject matter, the link between topology and the KS2 science curriculum, added to the star quality of the Scottish End-Beast Type, made for an activity that used the 3D models for a sound educational reason. An entry in the CASSS volumes' 'Evidence for Discovery' category would seem an even more recondite location to find subject matter for a KS2 lesson, but with some research in the Cumbria Record office and the online British Geological Survey map, it provided the potential for a lesson plan rich in higher order learning outcomes.

And perhaps even the cross-curricular nature of contemporary Archaeology itself contributes to the ease with which lesson plans can serve a cross-curricular purpose, particularly in a primary school setting. So, for example, Miller's work on the materiality of the Gosforth Cross can reinforce work on rocks the pupils are required to do by the science curriculum.

12.1 Conclusion

The criticism could be made of this research that it seeks to use navigable online 3D models of stone sculptures just because they have become available. It could be viewed as an example of education

feeling compelled to adopt new technologies as 'must haves', simply because of their newness: another faddish embodiment of McLuhan's aphorism that 'Invention is the mother of all necessities' (1973).

The defence against such a charge rests on a simple line of argument. An understanding of the past benefits greatly from an understanding of primary sources. There is a dearth of written materials dating from the early medieval period in north-west England, yet early medieval stone sculptures provide a bank of primary sources at once strange and resonant. In some ways, as Elliot said of good poetry, they communicate before they are understood. They are sufficiently complex to beguile academics into devoting decades of research and reflection, yet accessible and engrossing enough for primary age children to enjoy investigating. Online 3D models can now virtually teleport these primary sources into the primary classroom. Why would a teacher turn down such an opportunity? True, the objects are not physically present in the room with the children, but in some respects, sculptures such as the Gosforth Cross are more clearly viewed in a *virtual* Cumbria where the *virtual* sun does exactly what it is told; even shining from due north, should that be needed to highlight some detail sandpapered down by over a millennium of weather.

The use of 3D models in film was also an integral part of the research**.** The Gosforth videos made for the RSA project pioneered the combining of antiquarian drawings made when the marks were clearer to read, with photogrammetry. Together with the Halton film, made in preparation for the present project, they helped reinforce children's learning at the end of two intense lessons. Film can also convey in a few seconds, difficult concepts such as the relationship between the angle at which the Gosforth cross was carved and the size of the block of stone that would need to be quarried. Additionally, it can be used to give learners silent guided tours of 3D models of objects if a more directed study of a sculpture is appropriate.

12.2 Contributions to Knowledge

The research uncovered an alternative provenance for *Penrith 11* based on evidence not available to the authors of the second volume of CASSS (Bailey & Crump, 1988). It also identified a discrepancy between the descriptions of two of the hogbacks and their illustrations in the Corpus of Anglo-Saxon Stone Sculpture's taxonomy .

The thesis makes the first comment on the significant asymmetry of *Brompton-in-Allerdale 17* and uses it to argue for a more practical craft-based interpretation of some aspects of early medieval stone sculptures.

No previous map of the whole of the British Isles seems to have been made combining overlays of the find locations of known hogbacks with place names containing Norse elements.

The research, and preparation for it, also produced the first 3D models to be published online of; the Heysham Hogback (*Heysham 05)*, the Halton Cross (*Halton 01*), an Anglo-Saxon cross fragment at Halton (*Halton 05),* the Little Clifton cross-shaft (*Great Clifton*), a Neston cross-shaft (*Neston 3*), the limestone crucifixion plaque in Kendal Museum (*Penrith 11)*, the West Kirby Hogback (*West Kirby 04*), the Pennington Tympanum, and, to date the sole example of any Brompton hogback (*Brompton-in-Allerdale 19*).

The high-resolution texture of the *Penrith 11* model has revealed more polychrome traces than identified in the CASSS entry. Similarly, the model of *Great Clifton* shows some possible gesso and flecks of green and red.

The research also made the first published use of Augmented Reality as a way of comparing 'real life' artefact with a 3D model of a similar piece.

A search of the literature could not uncover any previous mention of the evidence that cooperation between Anglo-Saxons and Vikings was removed at a late stage from the English National History curriculum.

12.3 Recommendations and Future Plans

School teachers have little time available to extend their subject knowledge, particularly so in the primary sector. There is a role for cooperation between University faculties on a wider use of Lesson Study-based research as a means of creating learning resources for schools.

Several additions and amendments to the resources need to be made. The short film 'Gosforth Cross: *New Angles*' (Lang, 2019d) would benefit from an extra section explaining the theory from a sculptor's

perspective. A how-to video demonstrating a method for creating optimum screengrab films of Google Earth virtual flights from a school to the location of an object or event being studied would be a useful aid for teachers and learners.

Further trials of the resources focussed on *Penrith 11* are necessary before they are more widely published. The possibility of using spectrometry on the polychrome, and carbon^{14} dating on *Penrith 11* should also be explored.

Once finalised, the resources should be published online, perhaps in the TES Resource bank and the possibility of encouraging teachers to publish their own reworkings of the materials under one of the creative-commons licenses should be explored.

The integration of the Sketchfab models into the lessons offers a chance to encourage pupils to develop skills in 3D modelling at the same time as practicing archaeological reconstruction. (Appendix 3).

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Appendix 1 Vikings in Victorian Art

In the same year that Dickens' Child's History was published in book form, his friend, Daniel Maclise encapsulated a view of the imagined moment at which the Danes' journey to becoming 'good, honest English men' began. 'Alfred,the Saxon King (disguised as a minstrel) in the tent of Guthrum the Dane' (Figure 43), illustrates the apocryphal story of Alfred, after a recent defeat, disguising himself as an itinerant harper and entering the Danes' camp while they celebrate victory.

The painting was widely known at the time and given 'pride of place' at that year's Royal Academy Summer Exhibition (Spectator, 1852).

Figure 43 : 'Alfred the Saxon King (disguised as a minstrel) in the tent of Guthrum the Dane'
Daniel Maclise 1852. Laing Gallery, Newcastle. Photo: R. Lang.

Figure 44: Maclise 1852, detail.
Photo: R. Lang.

Alfred wears the shell badge of a Christian pilgrim on his shoulder (Figure.44), so it is possible his performance has a religious content. He is also pictured with red hair, the only such depiction according to Parker (2009), who reckons the most likely reason to be some reference to the painter's Irish birth and maternal ancestry, Ireland was long known as having the greatest concentration of red-heads in the population, well before its genetic determiner was identified (Moffat &

Willson, 2011): Ireland having the world's highest concentration of carriers of the allele). The artist painting a Celtic Alfred. Another possibility, is that Maclisse saw, as a work in progress, Holman Hunt's first depiction of Christ as 'The Light of the World' which he probably started in 1851 (Roskill, 1963). Maclisse was on the periphery of the Pre-Raphaelites who admired his skill. Hunt's Christ has red hair and a red beard and wears a white robe, though the twilight setting dapples and darkens it.

Whatever the reason for his While the Danish troops celebrate with drunken enthusiasm, Guthrum and the higher ranks around him, appear to be listening to Alfred. Their faces reveal a melancholy void that military victory and binge-feasting cannot dispel (fig. 45).

Figure 45: Maclise 1852, detail
Photo, R.Lang

In a short while, Alfred, using the results of his espionage, will defeat them, Guthrum will convert to Christianity and the Danes will be irrevocably set on the path towards living 'good, honest, English lives' (Lang 2014). As Parker (2009), relates the Dickens-Maclisse value-judgement of Saxons viz-a-vis Vikings was in stark contrast to a contemporary pro-Norse school of thought typified by J.M.Ballantyne. The concluding paragraph of Ballantyne's children's novel 'Erling the Bold' reads as a direct opposite of the Dickens passage quoted above as well as giving a pre-echo of the contemporary interest in ancestral d.n.a.;

> "Yes, there is perhaps more of Norse blood in your veins than you wot of, reader, whether you be English or Scotch *(sic)*…We have good reason to regard their memory with respect and gratitude, despite their faults and sins, for much of what is good and true in our laws and social customs, much of what is manly and vigorous in the British Constitution, and much of our intense love of freedom and fairplay, is due to the pith, pluck, enterprise, and sense of justice that dwelt in the breasts of the rugged old Sea-kings of Norway!" (Ballantyre, 1869 p437).

Any widely read, or widely read-to, late Victorian children certainly received a mixed message about their Norse antecedents. The ENC content suggestions offer no such confusion, in essence containing nothing that jars with Dickens and Maclisse.

Appendix 2 Transcripts of Interviews with Teachers

School One Recorded on the afternoon following the combined Sigurd and Ragnarök lessons

RL: Was the lesson pitched at the right level?

T: Yes, I think it was. I know one boy has already been (to see the Viking Age Halton Cross) last night. He'd told his mum about it and on the way back after hockey they went to find it and sent some pictures in today. So yes, I think it did grasp them and the level and the stories are definitely year 5, so that side of it was really good.

RL: So do you think you could use some of the resources as part of an English/Literacy lesson as well as in History?

T: 100%. Yes, I've already looked at that and thought about it. I think that bit about showing the children that the way you gave them that picture (11th century Swedish Sigurd carving) and them having to create their own myth — I think knowing the kids myself, I could really push and stretch them. I think I will definitely use this next year. And again, myths and legends is one of our topics. We did it with Egyptians, but it's also good to recap, and we could go over myths and legends from Viking times.

RL: How engaged did you think the children were?

T: I was impressed from the start how they were engaged and it was quite a warm afternoon. I think towards the end they started to tail: it didn't help with our server going down. I think if they'd had their own (silent video of the Halton Cross 3d model) to look through that would definitely have added to their engagement.

RL: How feasible do you think it would be to put the movies onto the individual laptops?

T: If they were online, we could all get on the internet…I think trying to get them onto the individual laptops is quite a big task. I didn't realise the server would be a pain – I didn't realise the kids wouldn't be able to access that. I think it would be better if it was online.

RL: It is online, but it would probably still be a strain on the network anyway, if the kids were trying to all get onto the same video…

T: Could we get them to open it at the start of the lesson? I know they do struggle with laptops open, but if it was buffering, that might be an option.

RL: If you were using that lesson plan with another class in the future, how would you adapt it so the children's learning could be improved?

T: I think there was quite a lot of teacher talk. Which is great for the older kids, but I think at this age maybe give them a storyboard of those pictures. I think what I would do is take a screenshot of the parts of the video for them to use to create their own version of the story I think I'd do that. Or some drama – tell them part of the story, get them to act it out, then freeze-frame and take a photograph of them trying to represent that incident in the story. I think that would be quite an exciting way to do it.

RL: Yes, thanks, I think that's really good.

T: I skip read through what the kids had written (on their feedback forms) and one of them suggested using drama and I thought 'yes, that would lend itself really nicely to recreate the key carvings. Obviously the blacksmith ones – I can think of at least four of those boys who would like to recreate that with a jumper over their head and perhaps something on the floor next to them. (referring to the beheaded Regin).

RL: So would you use the elements of the resources — the films, the drawings, whatever — in a lesson of your own devising, or might you keep to the basic framework of the lesson plan?

T: I think your knowledge of the story was so good, I think for me, that was really useful to see and hear. So that side of it — now I would feel more confident. I would take those elements, and I think with it being local, that really grasped them, and it's just down the road – that really interests my class no end. So being local as well as in Sweden I'd use that interest but, like I say add some drama so that they are up and moving, because, as I said it was humid afternoon.

RL: Supposing you hadn't seen the lesson yesterday afternoon — what extra elements could be added to the package of the resources to give teachers the confidence to deliver the lessons themselves?

T: I think that story written alongside screenshots so you could see which parts of the carvings related to which parts of the story. I think then we as teachers could piece that into our own presentation. I think that would be the biggest help. Because even when the carvings are highlighted in red, it can be difficult to see what they are meant to be — is this a snake or a tree? — for my own use, that would help.

RL: I suppose, would an edited video of the lesson be of any use?

T: For me, I wouldn't watch another class doing a lesson. I couldn't comment for every teacher, but I think classes are so different – well, I know some people do do it, so there must be some people who do watch them, but I just want the overview of it. As a teacher, I know what my class are, I know what will work: if I've got the knowledge and resources. I think that's more important to me.

R I could come in at the end of morning school and set up anything they would need on the laptops during the dinner hour. And if we could check that Sketchfab could be accessed by the children.

T Sketchfab?

R Yes, it's the site the 3D models are on. I'll show you what it looks like…

Yes, this is what the (Heysham) Hogback looks like. And that's the 'Loki stone'

T OK.

R And this is the piece in the Kendal Museum. Which, in the official book about everything (medieval stone sculptures) before the Norman Conquest (CASSS), it says it came from Penrith, but I don't think it did, and there's some information that's come to light since the book was written that suggests it didn't.

T So would this be good on tablets then?

R Yes, you can move it about on a tablet.

It's about the same date as the other pieces – it's still got bits of paint on it, because all of these would have been painted at the time, and it's remarkable for that reason, and you can zoom in and discover other little bits of paint…

T Which I think they would love doing, and that's a bit of ICT as well…

R Yes. These are the soldiers either side of Jesus, the one with the spear on this side and the guy with the sponge on a stick with vinegar on the other. It's like a brass plaque that was made in Ireland around that time and it seems to have been copied from one like that And I've got extracts from the Lowther Estate inventory which I have typed out to make more legible and a photo of the catalogue when the Lowther collection was auctioned off. So they can do sort of detective work. Also it's carved from limestone – everything in Penrith is sandstone – so it's not likely to have come from there.

T Yes, that's quite good actually,

R There's also geology – the actual bedrock of the area – they can check that out on the British Geological Society website. Anyway, they will have a bank of information…

T So then they could write, 'I believe this is important …. because of a, b c d …. Because the bedrock is in the wrong place…'

R Yes

T Which would be quite good for their investigative skills

R Yes – analysing – which is what the History syllabus says

T Yes, that's a really big part that we haven't done yet, so this would be very useful.

School 2 Transcript: Conversation with Headteacher and KS2 Teacher about the Halton and Gosforth Lessons

H Even though they had learned something about the Vikings in the past, they were applying that knowledge in a completely different context and it was an aspect of history of the Vikings that they hadn't covered before, wasn't it?

T Yes

H And I loved the links to the aspects of English

T Yes the narrative aspects

H Looking at the visuals and trying to work out what the story was

T Yes and I think they all really engaged with that at whatever level, because they can all orally tell a story

H Yes, and they were working in mixed-age pairs or groups as well, so they were able to support each other.

RL Yes, do you think that's actually helpful for the older children – to have to pitch information at a different level for the younger ones?

T Definitely. I think our older children are really good at being teachers in the classroom; at explaining things and guiding, so it brings in all the higher order thinking skills of being able to assimilate the information and pass it on as well.

H And it was lovely when they had to present the information as well, the way the older ones were guiding the younger ones and giving them 'air-time' rather than just taking over; but prompting them and supporting them.

And some of the younger ones have better imaginations than the older children, so they could all take it as far as they wanted, couldn't they?

T Yes. I think the number of adults helped as well, a we could prompt them if they seemed to be getting completely the wrong end of the stick: just guiding them back towards it with a couple of questions.

RL So, would you use the lesson plan as is, or with alterations

RL What additional materials would help, for example the teacher in a previous school suggested a crib-sheet for the teacher so they would know (shows sheet to teachers) how the carvings fit with the narrative

T Yes, that would definitely help us. For guiding , and if we do follow-up work, that would definitely help us, because there's a lot of detail in there, and that would definitely help us.

H Yes, having something like that would definitely help consolidate the learning.

T Maybe a little crib sheet for the characters, because there are a lot of names in there that are unfamiliar and that's where the children can get a little bit confused as well.

T I think it was very good having you there to tell the stories, because it is important that the sagas aren't just read off a sheet: is there a video, or audio file or something that could be used?

RL That's a really good idea.

T Because I don't think that other people who aren't familiar with it are going to deliver it in quite the same way that makes it a living story.

RL Yes, I'll certainly do that. The only advantage the only thing is the eye-contact you have and perhaps if the teacher used (a film or audio) the first time they did the lesson, then perhaps after that they had the confidence to perform it themselves, that might be the best thing.
Because that's how they were originally performed – far better than I did it obviously, and at much greater length – that was a very compressed version

T Yes, but child-friendly which was good.

H Yes, they were all absolutely hooked weren't they

T Yes, they were.

RL How might you adapt the lesson plan to increase the children's learning?

H It depends what's gone on before, because we started this, didn't we having set the context, and having looked at where in history the Vikings came, that was useful, because when we were looking at that the week before, our children were thinking that the Vikings were B.C.

T Yes, so reinforcing the chronology and geography as well. We zoomed in on Sweden, didn't we, which was really good.

H Yes, and that did demonstrate some prior learning didn't it, because some of the children did know (where Scandinavia was). So that's it really, there are many good links with other curriculum areas and I think the literacy aspect was particularly strong - really excellent.

T Yes, and I think though we haven't come out of the less on with much physical (cross-curricula) learning, we can draw out the links later.

H Yes, we've been talking about that – the best way to record the children's learning and I was telling Daniella about the video you showed me of Gosforth children talking about their learning and whether we do something like that, that's an audio-visual presentation…

RL Well, I could give you that video without the soundtrack and they could make their own commentary and add that to it. Ans=d the Halton one as well.

H Yes that's a really good idea. I'd love to have something that we could put on our website. Because we know what the children have learnt a huge amount, but it's nice to have a record of that.

T And reinforce it as well.

RL I don't know what video editing software you have?

T If we can import it into iMovie, we've got iPads and the children can do voice-overthe children can do voice-overs.

School Two Transcript: Conversation with Headteacher about the Hogbacks lesson materials (due to staffing shortages, the lesson was not observed by a teacher)

RL If I could just talk you through these materials and see what you think of them, so the lesson itself was about Hogbacks as they had already seen the Heysham Hogback.

Hogbacks are amazing beasts, there's around 150-odd of them, mainly in fragments, sadly. Most of them turned up in the Victorian era when churches were being slightly re-built – or totally demolished!, because they had already been re-used as building materials for lintels or whatever in churches. Some of them have survived intact and some of them are staggeringly beautiful, highly skilled bits of work, others are sort of 'work-experience' jobs a bit of a mess. And they exist in different types. So the first activity that we did was to take this typology by Jim Lang who worked this out originally in the late 1960s and I gave them links to six online 3d models

H … and they worked out which ones they were?

RL Yes. And it wasn't that easy actually – and this will help when I do it in the next school – some of them thought that the hogbacks had to be decorated in exactly the same way as the ones in the drawings, but the drawings are

H just an example

RL exactly. I might add descriptions alongside the drawings and explain that they are just examples – so the G type just needs to have an image of any people or animals on the side, not exactly this one. Plus I'll add a little animation of this Scottish End-Beast type shuffling along just for fun.

H (laughs) brilliant!

Rl So anyway that was the way into the lessons. Showing something archaeologists do – categorizing things to make sense of them. The lesson started with a chart of the types of dog showing the different categories of them.

H Well that's a skill in itself isn't it; classification?

RL Yes, typology … there might be some other follow up that could work with that…

And then, I explained this map of places with Norse elements in their names as blue dots and places where hogbacks have been found with red or purple dots. And they are mainly where there were Viking settlements, there or thereabouts. Some places where there were Vikings but no hogbacks – but mainly where there was no stone to carve anyway.

RL So, I ended up reading these two theories to them; one of which basically is, Yes the Vikings made them, the other is No they didn't – what was going on at the time was a very fluid mixed culture and you can't really say that any one group were responsible. That's very much a modern idea – still not spread beyond the academic community. And there's some more recent information that mainly shows reasons why there possibly could be Viking influence for example how important bears were in Viking burials and cremations.

H Am I alright to get copies of these? If I'm doing follow-up with them

RL Yes, sure

H And this, again, the children haven't had sufficient experience of this – different ways to interpret - and so this is really valuable.

RL Yes, it's part of the National Curriculum

H Yes, it's one of the key skills isn't it?

School 3 Transcript

RL Were the lessons pitched at the right level?

T I think it was quite challenging. I think that for some of the less-able children, some of the concepts would need to be broken down. I think for the middle and higher ability children it was really good. It's hard to get right, obviously, if you don't know the class, and there's such a range in that class, anyway, from Tolkein readers and Dickens readers to ones that struggle to read… anything. I especially liked today (revised hogback lesson), it was a bit more visual and that's something the children tend to like. I think that's probably the only thing I would adapt – the pitching; simplify it a little, emphasis perhaps more on the stories, for the less able ones.

RL How engaged did they seem to be? It seemed hard to judge on the first day…?

T Yes, based on what they have been saying afterwards, and certainly based on the attention in the classroom, really engaged, very interested in the stories, in the mythology, they've been

talking about that a lot and enjoyed exploring the 3D imagery, and that was a real strength of it actually.

RL Would you use the lesson plan with other classes in the future?

T Yes, I would. I think I would probably break it down more, so spread it out into six lessons, and certainly use the resources lessons probably.

RL Can you see any cross-curricular uses for the resources?

T Yes, certainly. I really liked how you linked it to multiculturalism, how it reinforced some of the things we have been doing in RE, and some of the British Values curriculum as well. I might be looking to get some writing out of it as well, and Geography links, artwork — craft and design — yes certainly a lot of cross-curricular uses.

RT What extra materials would help give teachers the confidence to deliver the materials themselves?

T I might see what literature there was out there, maybe abridged versions of the stories, perhaps e-books… But I think the resources were really excellent actually.

Appendix 3

With the introduction in 2014 of computing programmes of study into the English national curriculum (DfE, 2013c), primary schools are required to teach pupils a number of coding skills, and to enable KS2 pupils to develop the capability to make use of a variety of software. One organisation that has provided free support to meet these requirements is *Code Club*, a part of the Raspberry-Pi Foundation UK based charity. As of 2018 there are 7700 Code Clubs in the UK with a network of volunteers and a bank of online explanatory videos. The organisation has recently added tutorials covering simple tasks using the Blender open-source software. Blender was the programme used to make the sections of videos for this research that incorporated the 3D models and to create the animation of Miller's theory about the technique used by the sculptor of the Gosforth cross.

During this research, two ways in which Blender could be used by children sprang to mind and it is intended to develop at least one of these as a future project. The first idea investigates polychromy on stone sculpture during the medieval period. The presence of paint on Penrith 11 and possibly on the cross shaft at Little Clifton was referenced in the 'Provenance' resource, but the full implications of the widespread practice of adding colour to sculpture were not exploited. The latest version of the Blender software, 2.8, has a more user-friendly interface that makes it more approachable than its previous iterations, it is now possible to supply learners with a blender file that has a scan of a hogback stone, such as Brompton 19, ready to apply colours onto it using the software's paint tool. They could also have a short film and supplementary text and image materials explaining the pigments and gesso materials that would have been available in during the medieval period. The children could be tasked with creating a reconstruction of what the hogback may have looked like when it was first finished.

As well as enabling schools to fulfil the requirements of the ENC, these learning activities have the potential to boost children's confidence in creating 3D objects in a 2D environment, a skill which if further developed is likely to remain an asset in obtaining employment later in life.

Appendix 4 Acknowledgements: Gosforth Cross Project

I would like to thank the staff and pupils of;

Caton Community Primary School, Lancashire,
Kirkby Stephen Primary School, Cumbria
St Mary's Primary School, Kirkby Lonsdale, Cumbria

for their kindness, patience and wisdom.

And for their contribution to the RSA Fellowship Gosforth Cross project; Professor Dominic Powlesland, Dr Pragya Vohra, Professor Jo Story, Professor Richard Bailey, Dr Holly Trusted, Alastair Simmons (RSA), Rev. John Riley, Jimmy Partington, and the pupils and staff of Richard Cobden Primary School, Camden and Gosforth CE Primary School, Cumbria.

Appendix 5 Sigurd and Fafnir

Sigurd and Fafnir

Hreidmar the dwarf had three sons;

Otr, who enjoyed turning himself into an otter and splashing about after fish,

Fafnir, who was big, fierce and selfish, and just the sort of chap likely to turn into a dragon,

and Regin, who was a skilful blacksmith.

One day the god Loki killed Otr, mistaking him for an otter because of his fur and his tail and the bits of fish stuck in his moustache.

Hreidmar was upset and cried a bit, then demanded Loki gave him lots of gold so he could reach closure and move on.

Loki stole a hoard of gold and a magic ring from a rich dwarf. He gave it all to Hreidmar just to get some peace.

The Dwarf King cheered up no end, until Fafnir killed him and took the gold for himself.

Fafnir hauled his loot up onto the moors and turned into a giant drag- on to guard his mound of treasure.

Regin was cross with Fafnir, but couldn't do anything about it because he had been off school with a slight cold the day they did 'How to Change into a Dragon Bigger than your Brother'.

Fortunately, Regin's stepson was Sigurd the superhero, the great-great-great-great-grandson of Odin. So Regin begged him to kill the dragon.

Sigurd reluctantly agreed that this was the sort of work superheroes had to do as part of their job-description, and asked Regin to make him a sword suitable for dragon-slaying.

When Regin finally made a blade Sigurd was happy with, he set off on his superhorse, Grani, to Fafnir's lair out in the moors.

Sigurd dug a pit and lay in wait for Fafnir. Soon he felt the ground shake as the dragon slithered down to drink in the nearby pool. As Fafnir passed over Sigurd, he plunged his sword deep into the beast's side and killed him. Regin reappeared, planning to kill Sigurd and take the gold for himself.

Sigurd removed the dragon's heart and roasted it over a fire. He burnt his finger by touching the heart to see if it was cooked. Sigurd sucked his finger to stop it hurting and swallowed some of the dragon's blood.

One of the lesser known side-effects of drinking dragon's blood is that it lets you understand what animals are saying. Sigurd overheard some nearby birds chatting about how Regin would kill Sigurd and keep the gold for himself.

Sigurd turned round, saw Regin moving towards him looking guilty, and chopped his head off.

He then loaded the gold onto Granni and trotted off for more adventures.

Appendix 6

Reading the Gosforth Cross: *Christian sources*

The Bible:

John's Gospel Chapter 19 verses 31-35

"Because the Jewish leaders did not want the bodies left on the crosses during the Sabbath, they asked Pilate to have the legs broken and the bodies taken down.

The soldiers therefore came and broke the legs of the rst man who had been cruci ed with Jesus, and then those of the other. But when they came to Jesus and found that he was already dead, they did not break his legs.

Instead, ***one of the soldiers pierced Jesus' side with a spear, bringing a sudden ow of blood and water****. The man who saw it has given testimony, and his testimony is true."*

Mark and Luke's Gospel

Both these versions of the Easter story say that Mary Magdalene brought spices to Jesus's tomb on the Sunday morning.

The Book of Revelation

The last book in the Christian Bible is a complicated account of what the writer believes says will happen at the end of the world. It has many similarities with the carvings on the cross;

The Four horsemen of the Apocalypse are featured in the Revelation story. This picture of one is taken from the 'Bamberg Apocalypse', an illustrated version of the Book of Revelation made in a German monastery not long after the Gosforth Cross.

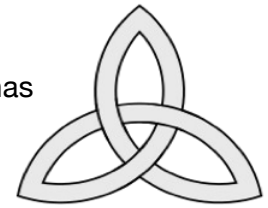
Satan Bound in Hell

Another section of Revelation describes ***Satan being tied up in Hell*** *with massive chains.*

A Dragon and a war in heaven *(Revelation Chapter 12, verse 7)*
"And there came war in the heaven; ***Michael and his messengers did war against the dragon****, and the dragon did war, and his messengers,"*

In a Christian story not found in the Bible, at the end of the world, **Archangel Michael will waken the dead with a blast on his trumpet**.

One of the hardest Christian beliefs to understand is the ***Trinity***. The 'Triquetra' has been used since before the Gosforth Cross to explain the idea. The shape is formed from one woven line, yet has three distinct points.



Appendix 7

Hogbacks: Theory 1

James Lang was an expert on Anglo-Saxon and Viking age stone sculpture.
In 1984 he wrote the first full catalogue of hogbacks. Here is a summary of his arguments.

- **He thought that the hogback was developed by Viking settlers** who had been influenced by Christian objects they had seen before they arrived in England.

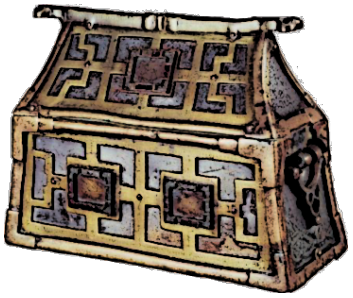
- **He believed the Vikings could have got the idea for the shape of the hogback when they were in Ireland.** They would have seen 'reliquaries' - small metal boxes used to hold bones from Christian saints. These had roofs with ridge-lines and some had creatures at either end facing each other, like many hogbacks.

Irish Reliquary Casket
late 7th–early 8th century

Original in the Metropolitan Museum of New York
Cartoonised image, R.Lang

Irish Reliquary Casket
8th century. Yew wood, bronze and enamel. Stolen in a Viking raid

Original in the Danish National Museum
Cartoonised image, R.Lang



- **They could also have seen caskets in Scandinavia that were made before the earliest hogbacks.**

Reconstruction of the Cammin Casket
Original was destroyed in World War II

Cartoonised image, R.Lang

Figure 30: Information sheet, Hogback Theory 1. Side 1.

- **It is unlikely that Anglo-Saxon shrine tombs were the model for hogbacks.** Most experts believe hogbacks were first made in Yorkshire. Only one Anglo-Saxon shrine-tomb has been discovered in the county.

- **Hogbacks were only produced after Vikings started settling in North England.** They stopped being made after the Norman conquest.

- **One of the Gosforth hogbacks was carved by the same sculptor who made the Gosforth Cross.** The Gosforth Cross shows many events from Viking myths.

Gosforth Cross
Early Tenth Century
Still from film: R. Lang

Detail from
The 'Saint's Tomb' Hogback, Gosforth
Early Tenth Century
3D model by Dominic Powlesland

Figure 31: Information sheet, Hogback Theory 2. Side 2.

Hogbacks: Theory 2

Howard Williams is Professor of Archaeology at The University of Chester. He has written several important articles about hogback stones. Here is a summary of some of his arguments.

He thinks hogbacks can't really be called 'Viking' creations, because;

- **There were already house-shaped stone tombs in Britain before the Vikings arrived.**

- **The Romans produced many tombs like this**.

Carved stone tomb found outside the walls of Roman London.
300-350 A.D.
Photo public domain.

- **The Anglo-Saxons made the same sort of objects after the Romans left**.

The Hedda Stone: Peterborough Cathedral.
Now believed to date from the from the Middle Saxon period about 7th century A.D.

3D model: Dominic Powelsland

- **So you can't really call hogbacks *Viking* objects. They are too similar to objects made before the 'Viking Age'.**

'Hogback Stone': Crosscannonby, North West Cumbria. This piece would probably have been much taller when it was made. Its shape would have been even more like the Hedda Stone.

Photograph: Tom Middlemass. Reproduced by kind permission of Corpus of Anglo-Saxon Stone Sculpture.

- **The bears on the ends of many hogbacks are probably a Christian symbol**.
A female bear would ferociously defend her young if any animal comes near them. There was also a common belief that bears were born shapeless and dead but were licked into life by their mother. So the bears on some hogbacks could symbolise Christ protecting believers and bringing them to eternal life after death.

  Also, bears spend the winter months in hibernation before becoming active again in Spring. This could also symbolise life after death.

Figure 32: Information sheet: Hogback Theory 2. Side 1.

- **It's wrong to say the shape of the hogback is just meant to be like a Viking hall**. Many other objects from northern Europe found by Archaeologists also use the same shape.

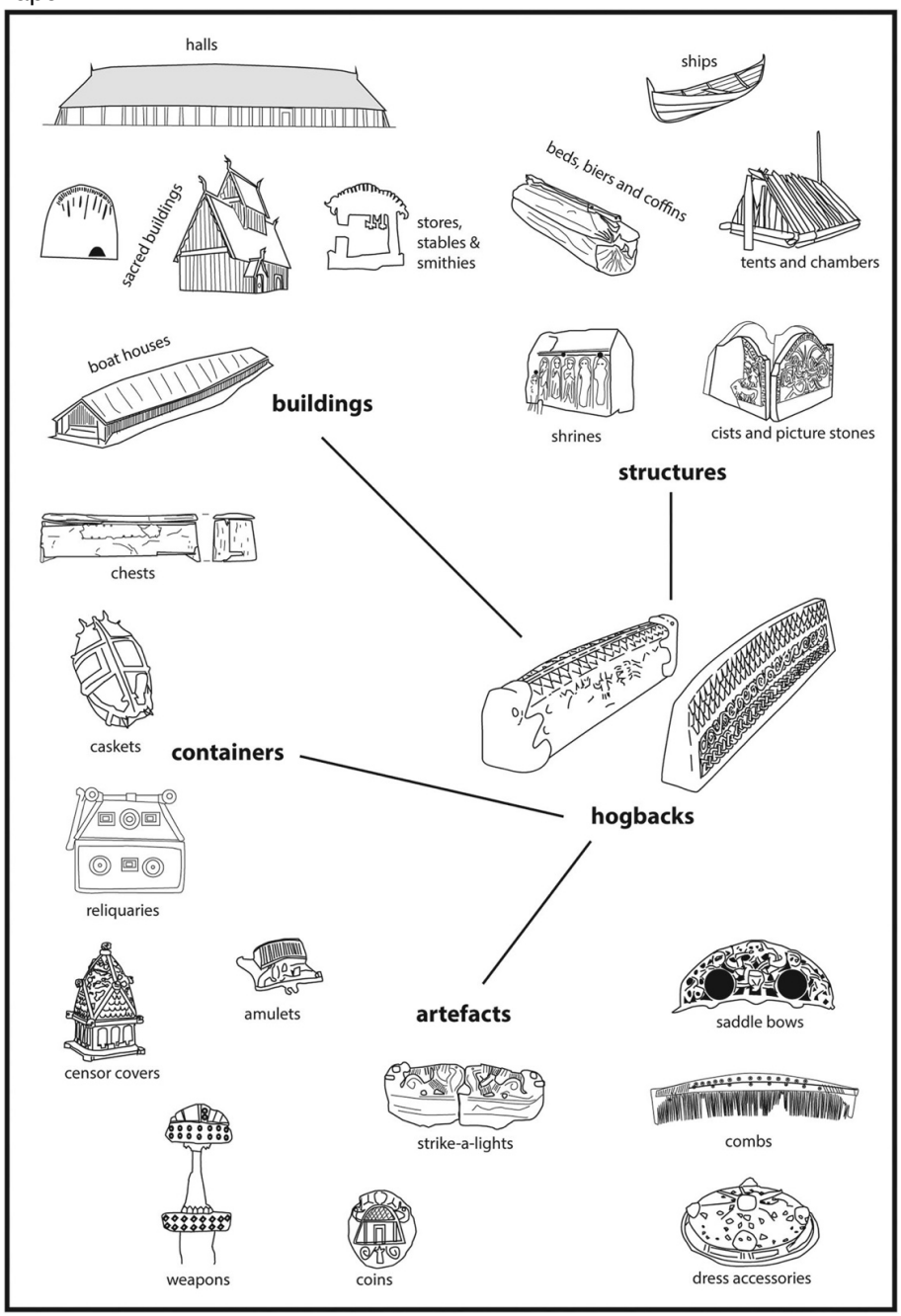


Diagram showing how the carvers of hogbacks would have seen the same shape used in many other objects. (From 'Citations in Stone' by Howard Williams)

- **The markings on 'Hogbacks' that seem to be from Viking sagas and myths aren't very convincing.** For example: the Heysham hogback doesn't show Sigurd sucking his thumb. It shows some birds, but they aren't in a tree. There is no Regin, nor a fire, nor a dragon's heart, nor any blacksmith's tools.

- It is true that many hogbacks are found were there are Norse names. However, **in all of the places the Vikings settled, there would have been other people living alongside them.**

Figure 33: Information sheet: Hogback Theory 2. Side 2. Diagram from Williams, H. (2016a) reproduced by kind permission.

Extra Information

- **The Hogbacks are almost all found where Vikings settled in the British Isles.**
- No hogbacks were made before Vikings arrived in England.

- **The shape of many hogbacks is like that of Viking halls.**

- The halls were very important in Viking beliefs. The Viking gods lived in a great hall called Valhalla.
- According to one myth, after Ragnarök, the only building to survive will be 'Gimle', a great hall that cannot be burned.

- There is strong evidence that religious ceremonies were performed in or near Great Halls.

Modern re-creation of Viking Age Long House. Fyrkat, Denmark.

- **Bears were important in Viking beliefs.**

- They seem to be associated with death and the afterlife. Archaeologists have discovered many graves in which the cremated remains have been lain over bearskins.

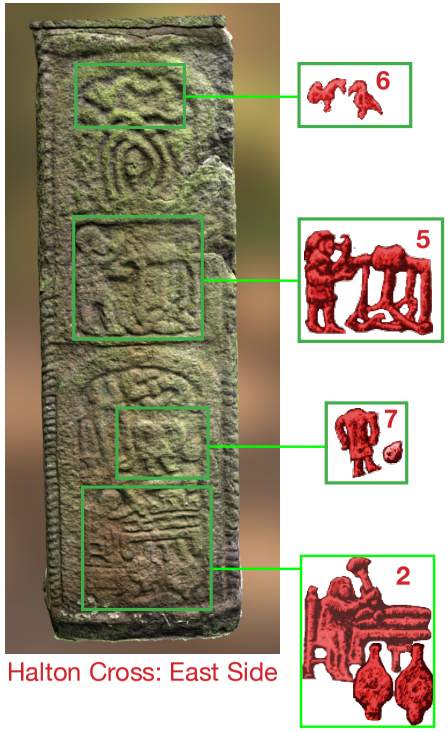
- The chief god Odin is described as shape shifting into a bear.

- Several of Odin's names contain 'bjorn' – the word for a bear.

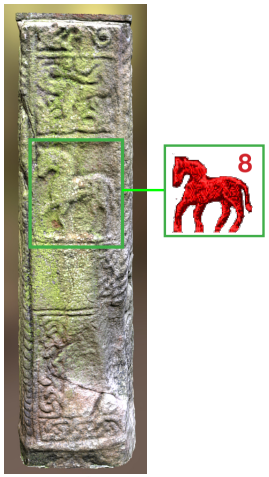
Bronze plaque: warrior with two bears. Öland,Sweden. About 600 A.D.

Figure 34: Extra Information sheet. Photograph of Fyrkat Longhouse by Jens Cederskjold, Wikimedia, Creative Commons Attribution 3.0 Unported. Photograph of one of the Torslunda plates, Public Domain.

Sigurd & Fafnir



Halton Cross: East Side



Halton Cross: South Side

Hreidmar was a rich dwarf who had three sons;

1 Otr who enjoyed turning himself into an otter and splashing about after fish,
Fafnir, who was big, fierce and selfish, and just the sort of chap likely to turn into a dragon,
2 and Regin, who was a skilful blacksmith.

One day the trikster-god Loki killed Otr, mistaking him for an otter because of his fur and his tail and the bits of fish stuck in his moustache.

Hreidmar demanded Loki gave him lots of gold so he could reach closure and move on.
Loki stole a hoard of gold and a magic ring from a rich dwarf. The Dwarf King cheered up no end, until Fafnir killed him and took the gold for himself.
Fafnir hauled his loot up to a cave on the moors and turned into a dragon to guard his mound of treasure.

3 Regin was cross with Fafnir, but didn't fancy fighting a dragon.

Fortunately, Regin's foster-son was a hero called Sigurd. Regin asked him to kill the dragon so Sigurd could become rich.
Sigurd asked Regin to make him a sword suitable for dragon-slaying.
When Regin finally made a blade Sigurd was happy with, he set off on his superhorse, Granni, to Fafnir's lair out in the moors.

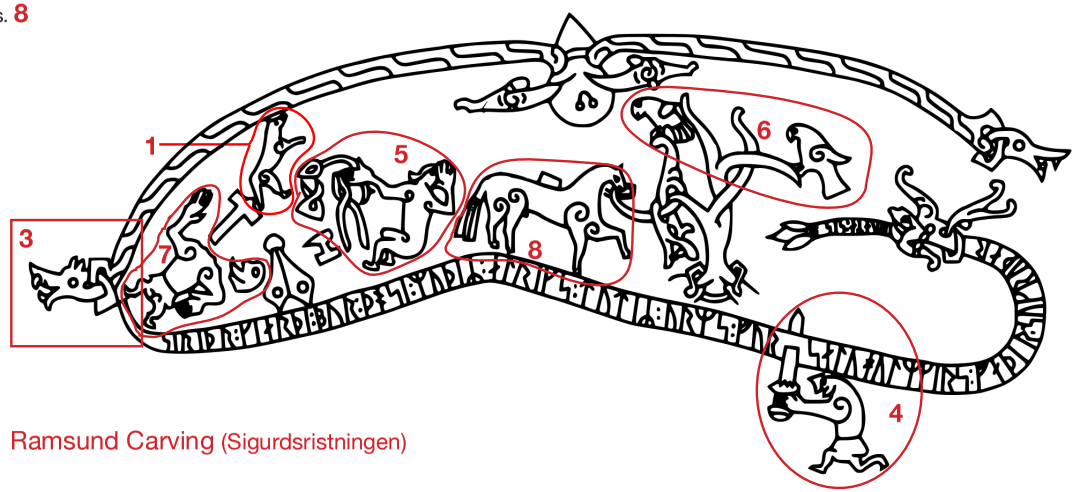
Sigurd dug a pit and lay in wait for Fafnir. Soon he felt the ground shake as the dragon slithered down to drink in the nearby pool. As Fafnir passed over Sigurd, he plunged his sword deep into the beast's side and killed him. **4**

Sigurd was hungry after killing the dragon, so he removed the dragon's heart and roasted it over a fire. He burnt his thumb by touching the heart to see if it was cooked. Sigurd sucked his finger to stop it hurting and swallowed some of the dragon's blood.**5**
One of the lesser known side-effects of drinking dragon's blood is that it lets you understand what animals are saying.

Sigurd overheard some nearby birds chatting about how Regin would kill Sigurd and keep the gold for himself. **6**

Sigurd turned round, saw Regin moving towards him looking guilty, and chopped his head off. **7**

Then he loaded the gold onto Granni and trotted off for more adventures. **8**



Ramsund Carving (Sigurdsristningen)

A3 Information sheet for teachers. Images of Halton cross from film by Lang (2017d).
Line drawing of Sigurd Stone, Ramsund, public domain.

Appendix 8

Appendix 9

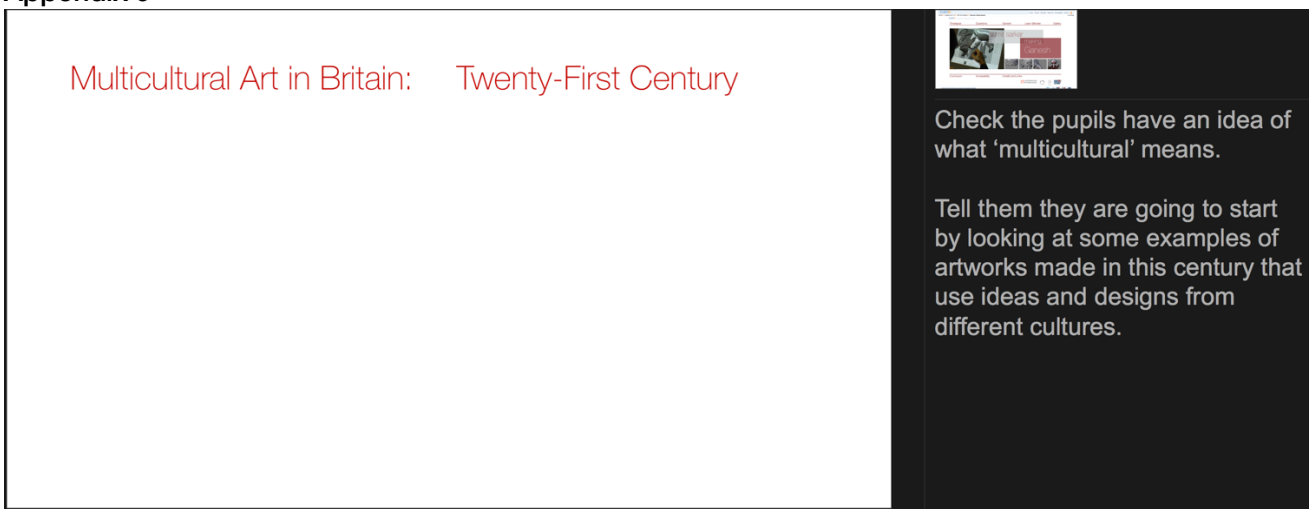


Figure 25: Slide 1

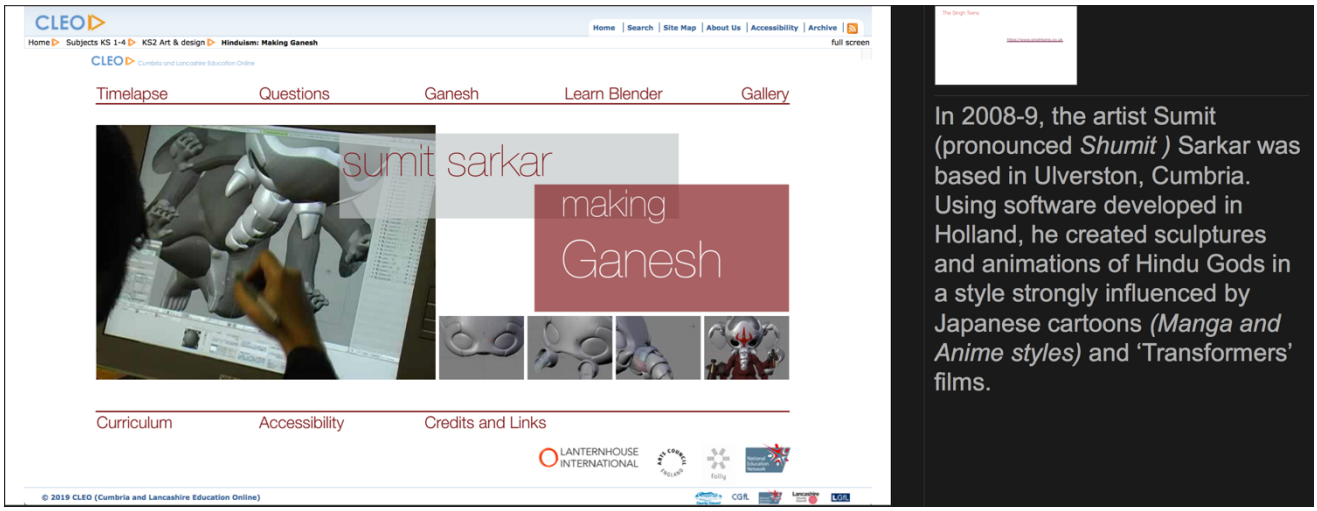


Figure 26: Slide 2 Screenshot from free education resource (CLEO, 2008).

Figure 27: Slide 3

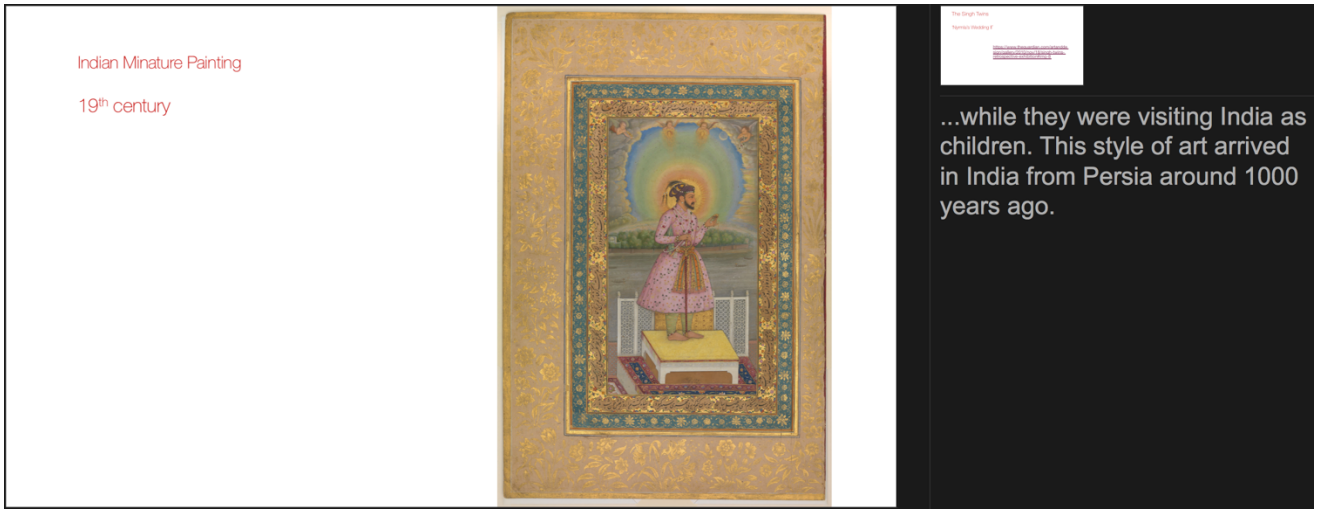


Figure 28: Slide 4. ‘Shah Jahan on a Terrace Holding a Pendant Set with His Portrait’. Wikimedia. Public Domain

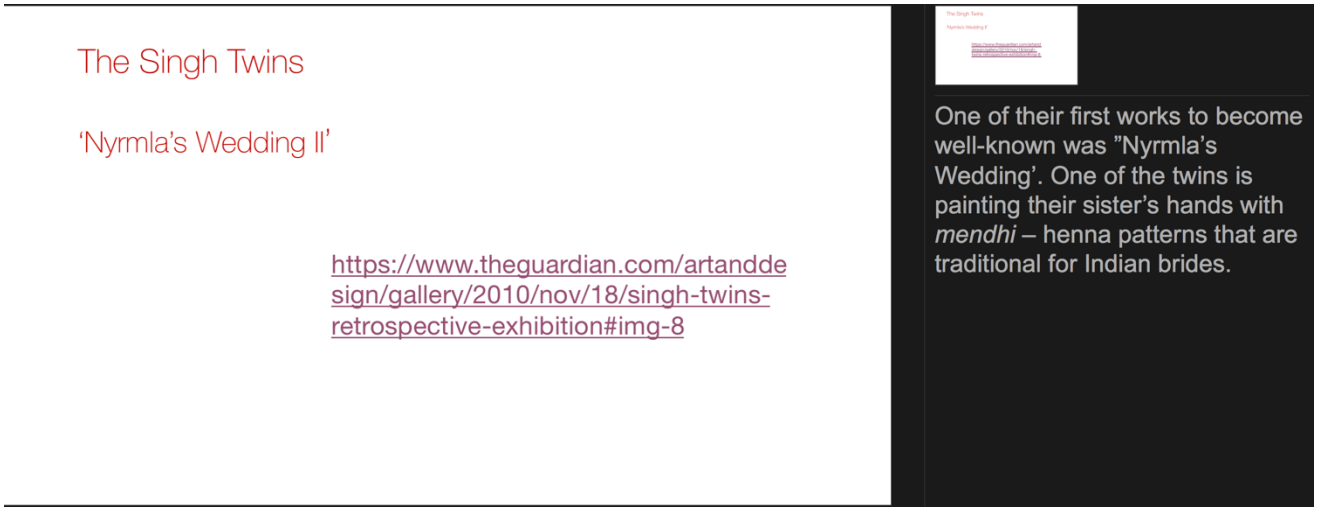


Figure 29: Slide 5

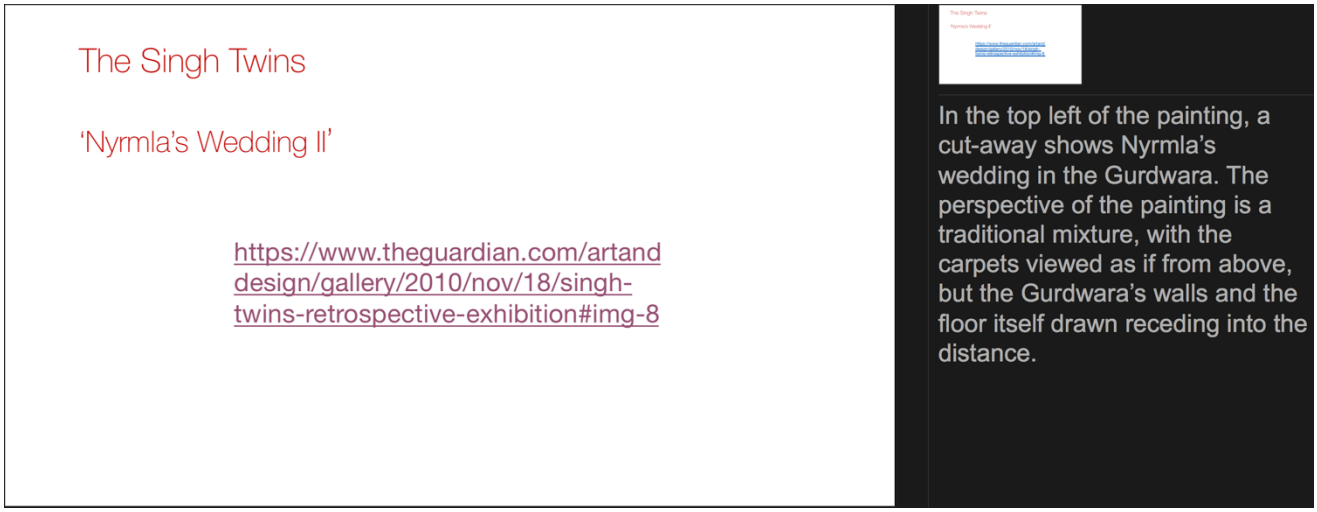


Figure 30: Slide 6

The Singh Twins

'Nyrmla's Wedding II'

https://www.theguardian.com/artanddesign/gallery/2010/nov/18/singh-twins-retrospective-exhibition#img-8

At the top right a relative carries a bowl of fruit, but behind her the Macdonald clown stares in through a window, holding a bottle of Cola. Behind him is an unnatural landscape wrecked by pollution. The window at the back of the Gurdwara opens onto a green landscape with blue cloud-flecked sky.

Figure 31: Slide 7

'Fighting for the Dunghill'

James Gillray

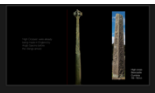
1796

They are also influenced by early English cartoons…
such as this one by James Gillray

Figure 32: Slide 8. Cartoon by Gillray, Public Domain.

Multicultural Art in Britain: Tenth Century

The Gosforth Cross



The British Isles were also multicultural 1100 years ago, as a close look at the Gosforth Cross shows…

Figure 33: Slide 9. Cropped photograph of Gosforth Cross. R. Lang

Figure 34: Slide 10. Cropped photograph of Gosforth Cross, R. Lang.
Photograph of Bewcastle Cross, Doug Sim. CC BY-SA 3.0

Figure 35: Slide 11. Cropped photograph of Gosforth Cross, and digital drawing, R. Lang.

Figure 36: Slide 12

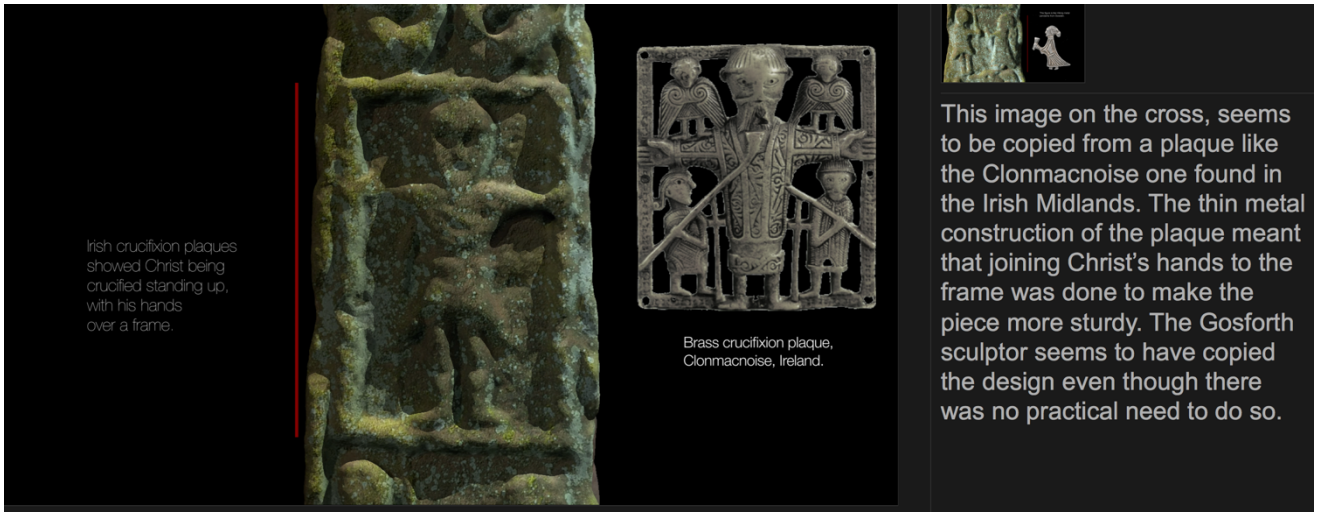
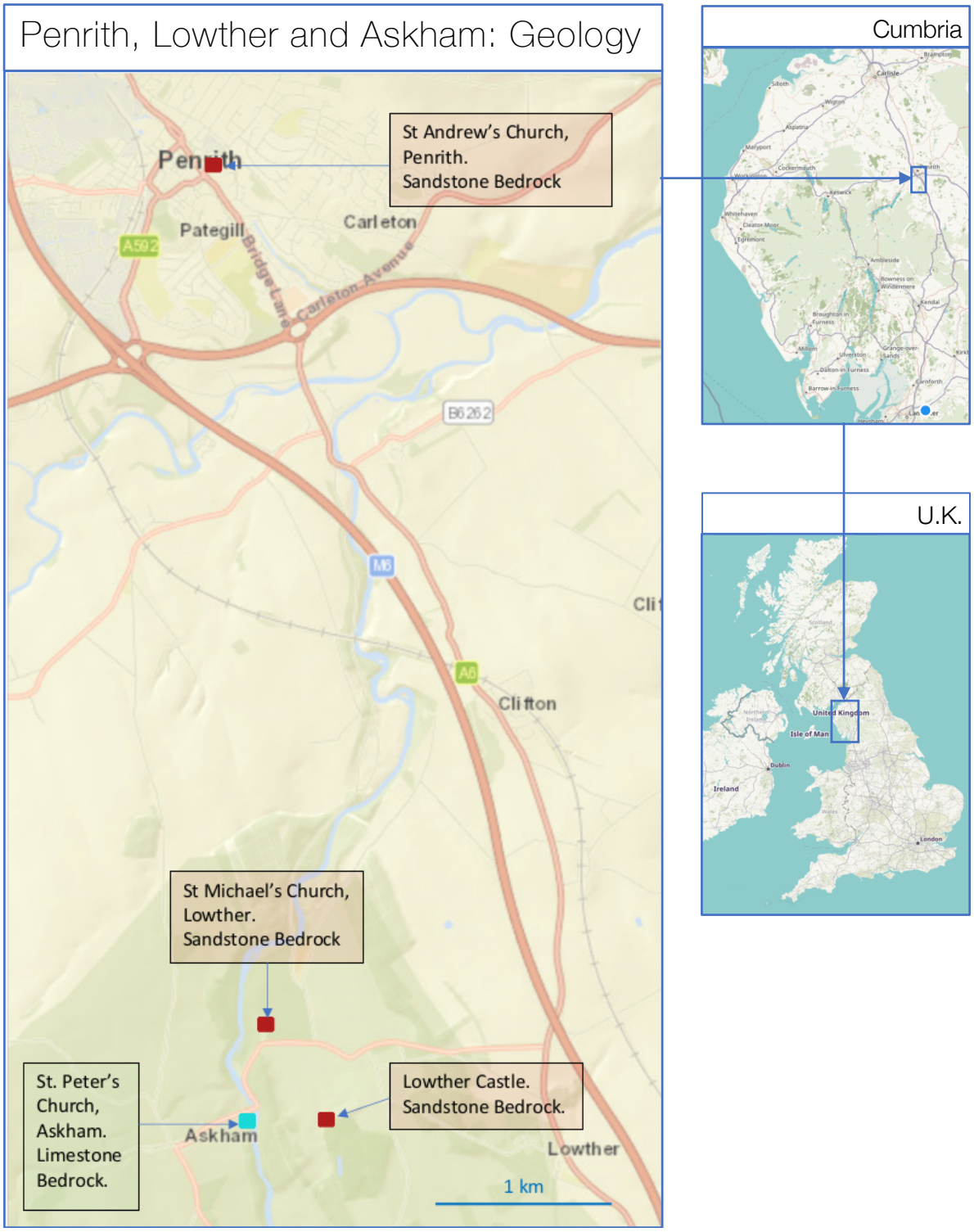


Figure 37: Slide 13 Cropped photograph of Gosforth Cross, and digital drawing reconstruction of the Clonmacnoise plaque, R. Lang.

Figure 38: Slide 14. Cropped photographs of 3 D models of *Brompton 19* and *Heysham 05*. R.Lang

Appendix 11



map: Open Street Map
bedrock information from http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Figure 39: Geology map. Open Street Map with bedrock information from British Geological Survey (2019).

Where did the stone for sculptures come from in the 10th century?

The stone used by sculptors in the time of the Anglo Saxons and Vikings, usually came from a nearby quarry. Often it would have been less than a mile from the Church for which the sculpture was made. Only very rarely would it have come from more than ten miles away.

(Summary of an extract from 'Viking Age Sculpture in Northern England' by Richard N. Bailey. Published by Collins: London 1980)

Information about Askham Church

The earliest historical evidence of a church in Askham…

(from https://www.british-history.ac.uk/n-westmorland-records/vol8/pp237-244#h3-0004)

"William de Romara, earl of Lincoln, gave the church and lands of Gamel the priest of Askham to Wartre Priory.

The gift was confirmed to the canons by Pope Innocent the 11th on 15th September 1140, and by Pope Innocent IV in the year 1245.

The church was rebuilt in 1832. "The Parish Church of Askham falling into decay was with the consent of William Earl of Lonsdale, Percy lord Bishop of Carlisle and churchwardens, taken down and rebuilt on the same site, greatly improving the accommodation."

The foundation stone was laid on 28 June, 1832, and the church was re-opened on Sunday, 18 August, 1833.

Was it always called St Peter's Church, and who was the architect of the present church?

Find out at https://www.visitcumbria.com/pen/askham-st-peters-church/ .

Figure 40: Information from Bailey (1980) and British History Online (2019)

Part of a list of objects in Lowther Castle made in 1878.

Curiosities & etc. Lowther Castle

Articles made Heirlooms by Earl William 2nd (1787 – 1872)

In the Glass case in the China Anti Room:

1 pair of satin shoes said to be the ones King Charles 1st was wearing when he was beheaded.
Piece of old pottery
A bronze Saxon bookstand found near Whtibeck
Roman stone found near Lowther
A chased (*finely made metal*) Ring found at Gussot Castle 1832
A ring found at Shap Abbey (*next to the grounds of Lowther Castle)*
Stone chopper (*axe*) found 1861. Supposed to be 2000 years old
Antique bronze figure riding a grotesque animal
Similar figure, parts wanting (*parts missing*)
Antique watch oval case
Silver watch
The canine tooth of a hyena found in Kirkdale Cave, York
A carved wood ring
A purse presented by Her Highness the Duchess of Kent, Gold Clasp
A Gold ring, found in digging the foundations of Carlisle jail.
A silver pendant. The Lowther Arms in front, Inscription (*on the*) reverse.
4 Large horns.
Gold pin. Shap fells Jasper. Presented by Mr Hodson 1837
Petrified Shell
Antique watch, oval case
2 bracelets found on a skeleton on Sleagill Common
3 Egyptian figures. Mummies.
Fragment of a Roman Altar, found at Old Carlisle. Marble. Erected 188 (*A.D.*) by King (*Emperor*) Augustus to Jupiter.
Similar fragment A.D. 191
Fragment of a Roman Altar, found at Boroughwall
Inscribed Stone found at Moresby, near Whitehaven, on Thrace Fell
Sculptured Stones, found near Lowther Church

Figure 41; Extract form Lowther Castle Inventory. National Archives (2019).

Entry in **The Corpus of Anglo Saxon Stone Sculpture, Volume 2 p. 140.**

What it says in simpler English…

Church Dedication
St Andrew

Present Location

Borough Museum, Kendal (on permanent loan from Abbot Hall Art Gallery)

Evidence for Discovery

First recorded in Richard Falkiner's London saleroom in 1981. Then catalogued as having probably once formed part of Lot 2326 of Maples's 1947 sale of Lowther Castle material ('Various fragments of sculpture probably emanating from churches and other buildings in the vicinity, and other unimportant fragments, about 20'). This Lowther origin supported by two reference numbers painted on Face C, reading 'LC 362' and 'L.C./80????4', where 'LC' can reasonably be expanded to 'Lowther Castle'. No catalogue of Lowther sculptural collection now survives to confirm provenance. Also painted on Face C is 'Penrith/Cumberland', which presumably indicates original provenance."

They believe the sculpture originally came from St Andrew's Church, Penrith.

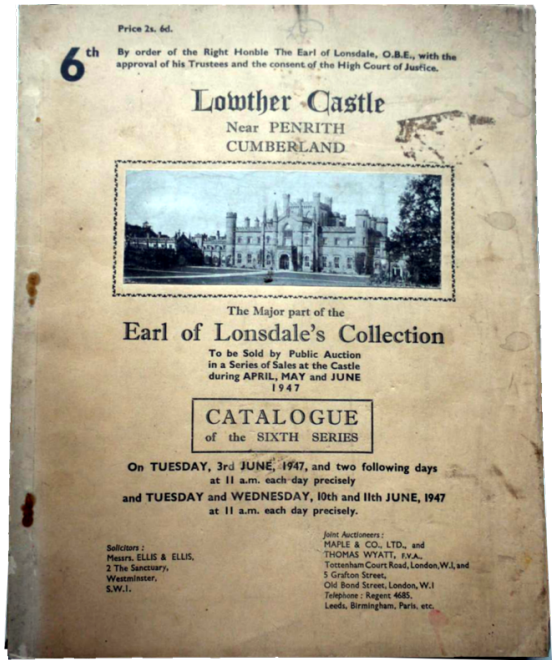
The sculpture is now in Kendal Museum. It has been loaned to them by the Abbot Hall Art Gallery.

Abbot Hall Gallery bought it in an auction in 1981. It had probably been auctioned before in 1947. That was when the owner of Lowther Castle sold his possessions.

It probably came from a church or another building.

Some numbers on the back of the stone were probably written for the auction.

The words 'Penrith / Cumberland' are also painted on the back. That probably says where the piece came from.


Price 2s. 6d.

6th

By order of the Right Honble The Earl of Lonsdale, O.B.E., with the approval of his Trustees and the consent of the High Court of Justice.

Lowther Castle
Near PENRITH
CUMBERLAND

The Major part of the
Earl of Lonsdale's Collection
To be Sold by Public Auction in a Series of Sales at the Castle during APRIL, MAY and JUNE 1947

CATALOGUE
of the SIXTH SERIES

On TUESDAY, 3rd JUNE, 1947, and two following days at 11 a.m. each day precisely
and TUESDAY and WEDNESDAY, 10th and 11th JUNE, 1947 at 11 a.m. each day precisely.

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Old Bond Street, London, W.1
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Leeds, Birmingham, Paris, etc.

Figure 42. Extract from The Corpus of Anglo Saxon Stone Sculpture (Bailey and Crump, 1988 p.140. Photograph of 1947 Auction Catalogue. Public Domain.